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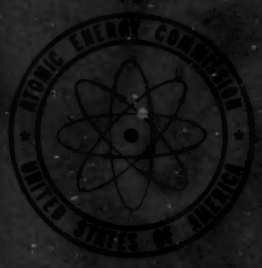
Nuclear Science Abstracts

Vol. 6 No. 14
Abstracts 3880 - 4338
July 31, 1952



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NUCLEAR SCIENCE ABSTRACTS

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ERRATA

NSA, Vol. 5, No. 22, p. ii. In first note regarding Vol. 5, No. 19, the abstract number 5042 should be 5141.

NSA, Vol. 5, No. 24, p. vi. Same as above.

NSA, Vol. 5, No. 24, p. 1254. For AECD-2863, 4-4859 should be 5-588 and the letters NSA should be omitted.

NSA, Vol. 5, No. 24, author index. The abstract reference 5-5042 for R. D. Anderson, Milton Burton, and S. Davison should be 5-5141. For Arthur O. Long and John E. Willard, 5-5141 should be 5-5042.

NSA, Vol. 5, No. 24, subject index. Under Hydrogen molecules, Methyl radicals, and Reaction mechanisms (organic), 5:5042 should be 5:5141. Under Cesium ions, Glass, Iron(III) ions, and Sodium ions, 5:5141 should be 5:5042.

NSA, Vol. 6, No. 10, p. 368. In abstract 2894, NSA 5-5141 should be NSA 5-5042.

REPORTS REFERENCE LIST

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The abstract number for each report is listed at the upper right of the entry. If the number bears an asterisk, the report is title listed only and no abstract is included.

U. S. ATOMIC ENERGY COMMISSION DECLASSIFIED REPORTS

AECD-3383 4219
[Argonne National Lab.]
CALIBRATION OF THE NEW ARGONNE STANDARD PILE, by C. Redman. Feb. 14, 1946. Decl. May 19, 1952. 7p. (AECD-3383; CP-3432)

AECD-3385 4180
Argonne National Lab.
THE NEUTRON SPECTRUM OF A RADIUM-BERYLLIUM PHOTO SOURCE; EXCERPT FROM ANL-4476, by C. Eggler. July 5, 1950. Decl. May 28, 1952. 10p. (AECD-3385; ANL-HDY-705)

AECD-3386 4195
[Metallurgical Lab., Univ. of Chicago]
EFFECT OF TEMPERATURE ON TOTAL RESONANCE ABSORPTION OF NEUTRONS BY SPHERES OF URANIUM OXIDE, by E. Creutz and H. Jupnik. [June 1942] Decl. May 27, 1952. 22p. (AECD-3386; C-110)

AECD-3387 4196
Metallurgical Lab., Univ. of Chicago
EFFECT OF GEOMETRY ON RESONANCE ABSORPTION OF NEUTRONS BY URANIUM and SUPPLEMENT NO. 1, by E. Creutz, H. Jupnik, and T. Snyder. [June 1942] Decl. May 27, 1952. 51p. (AECD-3387; C-116)

AECD-3388 4220
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CALIBRATION OF ARGONNE HEAVY WATER PILE (CP-3), by J. D. Richards. Aug. 15, 1949. Decl. May 27, 1952. 10p. (AECD-3388; ANL-4293)

AECD-3390 4182
Oak Ridge National Lab.
SLOWING DOWN OF FISSION NEUTRONS IN GRAPHITE; FINAL REPORT, by J. E. Hill, L. D. Roberts, and G. McCammon. Issued Jan. 19, 1949. Decl. May 29, 1952. 35p. (AECD-3390; ORNL-187)

AECD-3391 4218
Argonne National Lab.
PERFORMANCE OF SERVO MOTORS FOR REACTOR REGULATING RODS, by J. A. DeShong. Feb. 5, 1951. Decl. June 3, 1952. 19p. (AECD-3391; ANL-4614)

AECD-3392 4181
Oak Ridge National Lab.
THE SLOWING DOWN DISTRIBUTION FROM A POINT SOURCE OF FISSION NEUTRONS IN LIGHT WATER, by J. E. Hill, L. D. Roberts and T. E. Fitch. Issued Dec. 10, 1948. Decl. May 29, 1952. 29p. (AECD-3392; ORNL-181)

AECD-3393 4036
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CRYSTAL STRUCTURE STUDIES OF NEPTUNIUM METAL AT ELEVATED TEMPERATURES, by W. H. Zachariasen. Apr. 14, 1952. Decl. May 27, 1952. 12p. (AECD-3393; ANL-FWHZ-203)

AECD-3394 4074
Radiation Lab., Univ. of Calif.
STUDIES OF MATERIALS AT HIGH TEMPERATURES, by Russell Keith Edwards. Mar. 12, 1952. Decl. Apr. 23, 1952. 113p. (AECD-3394; UCRL-1639)

AECD-3395 4249
Radiation Lab., Univ. of Calif.
THE SPECIFIC ALPHA ACTIVITIES AND HALF-LIVES OF U^{234}, U^{235}, AND U^{238} (thesis), by Edward Homer Fleming, Jr. June 1952. Decl. with deletions May 19, 1952. 59p. (AECD-3395; UCRL-1788)

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AECU-1568(Rev.) 3883
Los Alamos Scientific Lab.
REVISED SEDIMENTATION CONSTANTS FOR FIBRINOGEN DETERMINED AT VARIOUS TEMPERATURES AND SPEEDS OF ROTATION, by Virgil L. Koenig and J. D. Perrings. [nd] 8p. (AECU-1568(Rev.); LADC-1023(Rev.))

AECU-2027 4283
Nuclear Physics Lab., Case Inst. of Tech.
THE ELECTROMAGNETIC PROPERTIES OF DIRAC PARTICLES, by L. L. Foldy. [nd] 19p. (AECU-2027; Technical Report No. 14)

AECU-2030 4031
Wisconsin Univ.
THE EXCHANGE REACTION BETWEEN HYDROGEN CHLORIDE AND ALUMINUM CHLORIDE, by Monte Blau and John E. Willard. [nd] 4p. (AECU-2030)

AECU-2031 3891
Oak Ridge National Lab.
EVIDENCE FOR SISTER-STRAND CROSSING OVER IN MAIZE (abstract), by Drew Schwartz. [nd] 1p. (AECU-2031)

AECU-2032 3892
Oak Ridge National Lab.
THE ROLE OF EXTERNALLY PRODUCED HYDROGEN PEROXIDE IN THE ACTION OF X RAYS UPON PARAMECIUM AURELIA (abstract), by R. F. Kimball and Nenita Gaither. [nd] 1p. (AECU-2032)

AECU-2035 4056
Institute of Engineering Research, Univ. of Calif.
REMOVAL OF RADIOISOTOPES BY SEWAGE TREATMENT PROCESSES; PROGRESS REPORT NO. 1, MAY 1, 1951 TO MARCH 31, 1952, by Warren J. Kaufman, Gerhard Klein, and Harold B. Gotaas. Apr. 15, 1952. 27p. (AECU-2035; Progress Report No. 1)

AECU-2038 4139
Los Alamos Scientific Lab.
A PROPERTY OF RANDOMNESS OF AN ARITHMETICAL FUNCTION, by N. Metropolis and S. Ulam. [nd] 3p. (AECU-2038; LADC-1177)

AECU-2039 3894
Los Alamos Scientific Lab.
THE PROTECTIVE EFFECT OF SHIELDED ECTOPIC BONE MARROW AGAINST TOTAL-BODY X-RADIATION, by J. B. Storer, C. C. Lushbaugh, and J. E. Furchner. [nd] 28p. (AECU-2039; LADC-1166)

AECU-2041 3911
Lovelace Clinic, Albuquerque, New Mexico
BILATERAL LENTICULAR OPACITIES OCCURRING IN A TECHNICIAN OPERATING A MICROWAVE GENERATOR, by Frederic G. Hirsch and John T. Parker. [nd] 8p. (AECU-2041)

AECU-2042 3958
Argonne National Lab.
AN X-RAY DIFFRACTION STUDY OF THE HAFNIUM-HYDROGEN SYSTEM, by S. S. Sidhu and J. C. McGuire. Apr. 29, 1952. 17p. (AECU-2042; ANL-FF-290e; UAC-563)

AECU-2043 4197
Argonne National Lab.
INTERMEDIATE COUPLING AS ENCOUNTERED IN SOME OF THE p-SHELL NUCLEI, by D. R. Inglis. Apr. 1952. 16p. (AECU-2043; UAC-564)

AECU-2044 3882
Argonne National Lab.
PORTABLE EQUIPMENT FOR COLLECTING EXCRETA ON AN OUTPATIENT BASIS, by William B. Looney and William P. Norris. May 1952. 7p. (AECU-2044; UAC-565)

AECU-2045 4000
Notre Dame Univ.
EXCITED MOLECULE THEORY OF RADIATION CHEMISTRY OF LIQUIDS, by Milton Burton, John L. Magee and Aryeh H. Samuel. [nd] 4p. (AECU-2045)

AECU-2046 4140
[Oak Ridge National Lab.]
A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART I, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] June 14, 1951. 22p. (AECU-2046)

AECU-2047 4141
[Oak Ridge National Lab.]
A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART II, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] Oct. 4, 1951. 19p. (AECU-2047)

AECU-2048 4142
[Oak Ridge National Lab.]
A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART III, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] Jan. 2, 1952. 26p. (AECU-2048)

AECU-2049 4250
Argonne National Lab.
DECAY SCHEME OF $_{21}Sc^{48}$, by Dieter Kurath. May 1952. 2p. (AECU-2049; UAC-568)

AECU-2050 3922
Wisconsin Univ. Medical School
AN IMPROVED HISTORADIOGRAPHIC APPARATUS, by J. J. Clemmons and M. H. Aprison. [nd] 21p. (AECU-2050)

AECU-2051 4121
Research Foundation, Ohio State Univ.
ON THE PREPARATION OF MAGNESIUM TARGETS FROM MgO, by Leonard N. Russell, Warren E. Taylor and John N. Cooper. [nd] 3p. (AECU-2051)

AECU-2053 4252
Argonne National Lab.
GAMMA RAYS FROM Sc^{48}, by Bernard Hamermesh, Virginia Hummel, Leonard Goodman and Donald Engelkemeir. May 1952. 3p. (AECU-2053; UAC-571)

AECU-2054 3884
Biophysical Lab., Harvard Medical School
ELECTROLYTE SECRETION IN THE PANCREAS, by A. K. Solomon. [nd] 24p. (AECU-2054)

AECU-2056 3893
Cancer Research Inst., New England Deaconess Hospital, Boston
RADIATION REACTIONS IN PARABIOTIC RATS, by Joshua L. Edwards and Sheldon C. Sommers. [nd] 23p. (AECU-2056)

AECU-2057 4001
Notre Dame Univ.
INFLUENCE OF RADIATION DECOMPOSITION ON RETENTION IN THE SZILARD CHALMERS REACTION, by William H. Hamill and Russell R. Williams, Jr. Feb. 19, 1952. 10p. (AECU-2057)

AECU-2058 4002
Notre Dame Univ.
THE SZILARD-CHALMERS REACTION WITH INORGANIC COMPOUNDS OF IODINE, by Robert E. Cleary, William H. Hamill, and Russell R. Williams, Jr. Jan. 1952. 21p. (AECU-2058)

AECU-2059 4251
Notre Dame Univ.
RADIOACTIVITY PRODUCED IN PLATINUM BY SLOW NEUTRON CAPTURE, by Barun C. Haldar. [nd] 7p. (AECU-2059)

AECU-2060 3941
Purdue Univ.
THE RATE OF ENDOGENOUS RESPIRATION AS AFFECTED BY THE OXIDATION OF EXOGENOUS SUBSTRATES, by H. J. Blumenthal, Henry Koffler, and E. P. Goldschmidt. [nd] 8p. (AECU-2060)

AECU-2061 4113
Iowa State Univ.
THE FLOW OF GASES THROUGH PLASTIC MEMBRANES, by David William Brubaker and Karl Kammermeyer. May 2, 1952. 31p. (AECU-2061)

ANL-4782 4035
Argonne National Lab.
OXIDATION POTENTIALS OF THE NEPTUNIUM (III)-(IV) AND THE NEPTUNIUM (V)-(VI) COUPLES IN PERCHLORIC ACID, by Donald Cohen and J. C. Hindman. June 1951. 11p. (ANL-4782)

ANL-4783 4034
Argonne National Lab.
THE NEPTUNIUM (IV)–NEPTUNIUM (V) COUPLE IN PERCHLORIC ACID. THE PARTIAL MOLAL HEATS AND FREE ENERGIES OF FORMATION OF NEPTUNIUM IONS, by Donald Cohen and J. C. Hindman. June 1951. 12p. (ANL-4783)

ANL-4799 3936
Argonne National Lab.
COMPARATIVE CHRONIC TOXICITIES OF RADIUM AND PLUTONIUM, by A. M. Brues. Apr. 1951. 20p. (ANL-4799)

ANL-4806 4123
Argonne National Lab.
SATURATION PROPERTIES OF URANIUM FISSION CHAMBERS, by A. C. Lapsley. Mar. 31, 1952. 27p. (ANL-4806)

ANL-4808 4037
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THE ENTROPY AND LOW-TEMPERATURE HEAT CAPACITY OF NEPTUNIUM-DIOXIDE, by Edgar F. Westrum, Jr., J. B. Hatcher, and Darrell W. Osborne. Apr. 1952. 16p. (ANL-4808)

ANL-4816 4132
Argonne National Lab.
A VACUUM LOCK FOR ROUTINE SOLID ANALYSES WITH A MASS SPECTROMETER, by Charles M. Stevens. Dec. 1951. 13p. (ANL-4816)

CF-50-3-216 4058
Oak Ridge National Lab.
CORROSION TESTS ON VARIOUS ALLOYS IN AMMONIUM BIFLUORIDE SOLUTIONS, by J. L. English. Mar. 9, 1950. 7p. (CF-50-3-216)

CF-51-12-70 4048
Oak Ridge National Lab.
THEORETICAL AND EXPERIMENTAL ANALYSES OF NATURAL CONVECTION WITHIN FLUIDS IN WHICH HEAT IS BEING GENERATED. PART I. HEAT TRANSFER FROM A FLUID IN LAMINAR FLOW TO TWO PARALLEL PLANE BOUNDING WALLS; A SIMPLIFIED VELOCITY DISTRIBUTION WAS POSTULATED, by D. C. Hamilton, H. F. Poppendiek, and L. D. Palmer. Dec. 18, 1951. 21p. (CF-51-12-70)

CF-52-1-1 4049
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CF-52-1-2 4050*
Oak Ridge National Lab.
THEORETICAL AND EXPERIMENTAL ANALYSES OF NATURAL CONVECTION WITHIN FLUIDS IN WHICH HEAT IS BEING GENERATED. PART III. HEAT TRANSFER FROM A FLUID IN LAMINAR FLOW TO THE WALLS OF A CYLINDRICAL TUBE; A SIMPLIFIED VELOCITY DISTRIBUTION WAS POSTULATED, by D. C. Hamilton, R. F. Redmond, and L. D. Palmer. Jan. 11, 1952. 16p. (CF-52-1-2)

ISC-232 4010
Ames Lab.
CONDUCTANCES, TRANSFERENCE NUMBERS, AND ACTIVITY COEFFICIENTS OF AQUEOUS SOLUTIONS OF SOME RARE EARTH HALIDES AT 25°C, by F. H. Spedding and I. S. Yaffe. May 22, 1952. 20p. (ISC-232)

KAPL-730 3995
Knolls Atomic Power Lab.
THEORY OF THE LOW TEMPERATURE SPECIFIC HEAT OF GRAPHITE, by J. A. Krumhansl. Knolls Atomic Power Lab. and Cornell Univ. Apr. 25, 1952. 35p. (KAPL-730)

KAPL-737 4112
Knolls Atomic Power Lab.
DIFFUSION OF HELIUM AND XENON THROUGH POLYMERS, by F. J. Norton. Apr. 22, 1952. 15p. (KAPL-737)

LA-1382 4122
Los Alamos Scientific Lab.
EFFECT OF AMBIENT CONDITIONS ON THE PERFORMANCE OF AN AINSWORTH MICROBALANCE, by James T. Waber and Gladys E. Sturdy. May 1952. 11p. (LA-1382)

LA-1386 4060
Los Alamos Scientific Lab.
MATHEMATICAL STUDIES OF GALVANIC CORROSION. PART III. EFFECTS OF POLARIZATION, by James T. Waber. Mar. 14, 1952. 13p. (LA-1386)

LAMS-1383 4198
Los Alamos Scientific Lab.
SEARCH FOR EXCITED STATE IN He^4. EXPERIMENTAL DETERMINATION OF THE Q VALUE FOR THE T(d,n) He^4 REACTION, by Louis Rosen. Feb. 1952. 13p. (LAMS-1383)

MLM-658 4145
Mound Lab.
REPORT FOR GENERAL RESEARCH OCTOBER 29, 1951 TO JANUARY 28, 1952 (Supporting Research Volume). Mar. 3, 1952. 25p. (MLM-658)

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A LOW-DENSITY PROPORTIONAL COUNTING GAS (Information Report), by E. H. Daggett. Feb. 20, 1952. 11p. (MLM-688)

NAA-SR-176 4036
North American Aviation, Inc.
TRANSIENT THERMAL STRESSES, by M. Heisler. Issued May 26, 1952. 33p. (NAA-SR-176)

NAA-SR-177 4046
North American Aviation, Inc.
FLOW OF GASES IN CONSTANT-AREA PASSAGES WITH FRICTION AND ARBITRARY HEAT ADDITION, by M. P. Heisler and H. Sletten. Issued May 15, 1952. 29p. (NAA-SR-177)

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A GENERAL METHOD FOR THE DETERMINATION OF THE THERMAL STRESSES IN A COMPOSITE MEDIUM, by J. Brandstatter. Issued May 23, 1952. 20p. (NAA-SR-184)

NYO-549 3959
[Carnegie Inst. of Tech.]
PROGRESS REPORT FOR JANUARY 1952, by Alan Rothman, D. S. McKinney, and J. C. Warner. [nd] 5p. (NYO-549)

NYO-1644 3888
Atomic Energy Project, Western Reserve Univ.
MONTHLY PROGRESS REPORT FEBRUARY, 1952, by Hymer L. Fridell. [nd] 9p. (NYO-1644)

NYO-3338 3889
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QUARTERLY PROGRESS REPORT FOR PERIOD JANUARY 1, 1952 TO MARCH 31, 1952, by Bernard E. Proctor and Samuel A. Goldblith. Apr. 1, 1952. 29p. (NYO-3338)

NYO-3494 4068
Arcos Corp.
THE INCIDENCE OF CRACKING IN THE WELDING OF TYPE 347 STEELS, by Lorin K. Poole. May 22, 1952. (NYO-3494)

NYO-4004 3895
Yale Univ.
PROGRESS REPORT FOR MARCH 1, 1951 – MARCH 1, 1952, by Ernest C. Pollard. Issued Mar. 28, 1952. 120p. (NYO-4004)

ORNL-1284 4131
Oak Ridge National Lab., Y-12 Area
ELECTROMAGNETICALLY ENRICHED ISOTOPES, INVENTORY, APRIL 30, 1952, by C. P. Keim, C. E. Normand, and Boyd Weaver. Apr. 30, 1952. 71p. (ORNL-1284)

ORO-68 3896
Tennessee Univ.
QUARTERLY PROGRESS AND WORK ACCOMPLISHMENT REPORT FOR QUARTER ENDING MARCH 31, 1952. [nd] 30p. (ORO-68)

TID-369(pt. E) 3957
Technical Information Service, AEC
BARIUM; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE, by Simone B. Schwind, comp. June 9, 1952. (TID-369(pt. E))

TID-3029 4009
Technical Information Service, AEC
LANTHANIDE SERIES RARE EARTHS; AN ANNOTATED LIST OF UNCLASSIFIED REFERENCES, by Robert L. Morgan, comp. May 29, 1952. (TID-3029)

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GERMAN REPORTS ON ATOMIC ENERGY; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE, by Lore R. David and I. A. Warheit, comps. June 6, 1952. (TID-3030)

UCLA-200 3890
Atomic Energy Project, Univ. of Calif., Los Angeles
PRODUCTION OF PHENOCOPIES IN AEROBACTER AEROGENES BY ULTRAVIOLET RADIATION, by Amos Norman. May 14, 1952. 21p. (UCLA-200)

UCLA-201 3965
Atomic Energy Project, Univ. of Calif., Los Angeles
GLUCOSE OXIDASE IN THE DETERMINATION OF GLUCOSE IN BIOLOGICAL MATERIALS, by William S. Beck. May 22, 1952. 8p. (UCLA-201)

UCRL-1688 3956
Radiation Lab., Univ. of Calif.
THE HEAT AND ENTROPY OF IONIZATION OF ANHYDROUS ACETIC ACID, by William L. Jolly. Apr. 1952. 11p. (UCRL-1688)

UCRL-1728 4194
Radiation Lab., Univ. of Calif.
THE MASSES OF THE HEAVY ISOTOPES, by Martin O. Stern. Apr. 14, 1952. 17p. (UCRL-1728)

UCRL-1749 4016
Radiation Lab., Univ. of Calif.
PAPER CHROMATOGRAPHY OF STEROIDS, by David Kritchevsky and Martha R. Kirk. May 15, 1952. 13p. (UCRL-1749)

UCRL-1759 3937
Radiation Lab., Univ. of Calif.
THE BIOLOGICAL BEHAVIOR OF ORGANIC COMPOUNDS CONTAINING RADIOPHOSPHORUS, by D. C. Morrison and Josephine F. Crowley. Apr. 25, 1952. 22p. (UCRL-1759)

UCRL-1760 4143
Radiation Lab., Univ. of Calif.
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 20, 1952, by S. Shewchuck. Apr. 11, 1952. 6p. (UCRL-1760)

UCRL-1761 4084
Radiation Lab., Univ. of Calif.
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 27, 1952, by S. Shewchuck. Apr. 14, 1952. 7p. (UCRL-1761)

UCRL-1766 4144
Radiation Lab., Univ. of Calif.
SCINTILLATING CRYSTAL GAMMA COUNTER (thesis), by Kenneth Durl Jenkins. May 1952. 37p. (UCRL-1766)

UCRL-1767 4223
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DISINTEGRATION OF HELIUM BY 90 MEV NEUTRONS (thesis), by Peter E. Tannenwald. Apr. 1952. 69p. (UCRL-1767)

UCRL-1772 4222
Radiation Lab., Univ. of Calif.
SPONTANEOUS FISSION OF U^{234}, Pu^{238}, Cm^{240} AND Cm^{244}, by A. Ghiorso, G. H. Higgins, A. E. Larsh, G. T. Seaborg, and S. G. Thompson. Apr. 21, 1952. 5p. (UCRL-1772)

UCRL-1777 4014
Radiation Lab., Univ. of Calif.
ANION EXCHANGE OF NIOBIUM IN 7.0 MOLAR HYDROCHLORIC ACID, by E. H. Huffman and G. M. Iddings. Apr. 23, 1952. 4p. (UCRL-1777)

UCRL-1783 4248
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INVESTIGATIONS OF COMPLEX STRUCTURE IN ALPHA EMISSION WITH NUCLEAR EMULSIONS, by Dean C. Dunlavey and Glenn T. Seaborg. Apr. 25, 1952. 5p. (UCRL-1783)

UCRL-1784 4193
Radiation Lab., Univ. of Calif.
FIRST EXCITED STATES OF EVEN-EVEN NUCLIDES IN THE HEAVY ELEMENT REGION, by Frank Asaro and I. Perlman. Apr. 25, 1952. 5p. (UCRL-1784)

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SUMMARY OF THE RESEARCH PROGRESS MEETING OF FEBRUARY 28, 1952, by Sergey Shewchuck. Apr. 30, 1952. 5p. (UCRL-1793)

UCRL-1795 4083
Radiation Lab., Univ. of Calif.
POWER SUPPLY FOR NUCLEAR RESEARCH LABORATORIES, by Carl Grauer. Apr. 1952. 18p. (UCRL-1795)

Y-F31-4 4057*
Oak Ridge National Lab. (Y-12)
TESTING AND EXAMINATION OF THERMAL CONVECTION LOOPS OPERATED WITH LITHIUM AND LEAD, by R. B. Day and A. deS. Brasunas. Aug. 20, 1951. 18p. (Y-F31-4)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AF-TR-6596(pt.I) 4073
Wright Air Development Center
TITANIUM-NICKEL PHASE DIAGRAM, by John P. Nielsen and Harold Margolin. Wright Air Development Center and New York Univ. Oct. 1951. 23p. (AF-TR-6596(pt.I))

DC-52-2-24 4044*
Babcock and Wilcox Co.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO LIQUID LITHIUM AND CORROSION STUDIES OF LIQUID METAL SYSTEMS; PROGRESS REPORT JANUARY 15, 1952 – FEBRUARY 15, 1952, by A. W. Dana, Jr. and O. H. Baker. Feb. 15, 1952. 7p. (DC-52-2-24; ES-782-783; Report No. 5226)

NACA-TN-2704 4067
Pennsylvania State Coll.
FATIGUE STRENGTHS OF 14S-T4 ALUMINUM ALLOY SUBJECTED TO BIAXIAL TENSILE STRESSES, by Joseph Marin and W. P. Hughes. June 1952. 24p. (NACA-TN-2704)

NACA-TN-2722 4047
Lewis Flight Propulsion Lab., NACA
DISPLACEMENT EFFECT OF A THREE-DIMENSIONAL BOUNDARY LAYER, by Franklin K. Moore. June 1952. 15p. (NACA-TN-2722)

NBS-1123 4114
National Bureau of Standards
HIGH TEMPERATURE THERMODYNAMICS TECHNICAL REPORT. Aug. 20, 1951. 348p. (NBS-1123; U19179)

NBS-1442 4138
National Bureau of Standards
PENETRATION AND DIFFUSION OF X-RAYS; MATHEMATICAL TECHNIQUES, by L. V. Spencer. Mar. 4, 1952. 17p. (NBS-1442)

NBS-1561 3983
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS:

HEAT CAPACITY, ENTROPY, HEAT CONTENT, AND FREE ENERGY FUNCTIONS OF BORON TRIFLUORIDE IN THE IDEAL GASEOUS STATE, by Rita M. Potocki and David Emerson Mann. May 15, 1952. 7p. (NBS-1561)

NBS-1586 3960
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF BORON MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. May 15, 1952. 10p. (NBS-1586)

NP-3767 4119*
Wisconsin Univ.
DOUBLE CRYSTAL AND SLIT METHODS IN SMALL ANGLE X-RAY SCATTERING, by Harold Ritland, Paul Kaesberg, and W. W. Beeman. [nd] 10p. (NP-3767; U9920)

NP-3775 4085
Research Lab. of Electronics, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT, by A. G. Hill, J. B. Wiesner, and G. G. Harvey. Apr. 15, 1952. 93p. (NP-3775; U21836)

NP-3787 4247
Engineering Research Inst., Univ. of Mich.
PROGRESS REPORT TO JANUARY 1, 1952; INVESTIGATION OF NUCLEAR-ENERGY LEVELS, by J. M. Cork. [nd] 44p. (NP-3787)

NP-3790 4076
Fansteel Metallurgical Corp.
FINAL REPORT; DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS; MAY 18, 1951 THRU FEBRUARY 29, 1952, by Stanley Kluz, Caesar Kalinowski, and Ralph Wehrmann. Mar. 28, 1952. 35p. (NP-3790; Laboratory Record Book No. 334; U21633)

NP-3794 4120
Pennsylvania State Coll.
APPLICATION OF HIGH FREQUENCY OSCILLATORS. I. CIRCUIT AND ARRANGEMENT FOR MEASURING REACTION RATES, by Donald G. Flom and Philip J. Elving. Dec. 10, 1951. 29p. (NP-3794; Technical Report No.11; U21904)

NP-3799 4004
Illinois Univ.
BIMONTHLY PROGRESS REPORT NO. 2 AUGUST 15, 1951 TO OCTOBER 15, 1951; STUDIES OF EFFECTS OF HIGH ENERGY RADIATION ON CHEMICAL SYSTEMS, by C. L. Clark, J. Fuchs, P. E. Bierstedt, and J. O. Gardner. [nd] 10p. (NP-3799; U19875)

NP-3800 4041*
Acoustic Research Lab., Harvard Univ.
THE TENSILE STRENGTH OF LIQUIDS: A REVIEW OF THE LITERATURE, by F. G. Blake, Jr. June 11, 1949. 84p. (NP-3800; Technical Memo No. 9; U6606)

NP-3801 4062
National Academy of Sciences
REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME, 1950-1951. National Academy of Sciences and National Research Council. 1952. 140p. (NP-3801)

NP-3808 4069
Battelle Memorial Inst.
INTERIM TECHNICAL REPORT ON CHEMICAL SURFACE TREATMENT OF TITANIUM TO WATERTOWN ARSENAL, by H. A. Pray, Paul D. Miller, and R. L. Gibbs. Jan. 31, 1952. 43p. (NP-3808; U22071)

NP-3811 4020
Michigan State Coll.
A MAGNETOCHEMICAL INVESTIGATION OF ADSORPTION; TECHNICAL REPORT NO. 1 JUNE 15, 1950–JUNE 30, 1950 AND AUGUST 15, 1950–DECEMBER 1, 1951, by Robert Vander Vennen and Max T. Rogers. [nd] 20p. (NP-3811; Technical Report No. 1)

NP-3813 4072
Carnegie Inst. of Tech.
RESEARCH AND DEVELOPMENT OF EFFECT OF RANGE OF STRESS AND PRESTRAIN ON THE FATIGUE PROPERTIES OF TITANIUM AND ITS ALLOYS. Mar. 1, 1952. 34p. (NP-3813; U21987)

NP-3814 4082
Research Lab. of Electronics, Mass. Inst. of Tech.
METHODS OF MEASURING THE PROPERTIES OF IONIZED GASES AT HIGH FREQUENCIES. II. MEASUREMENT OF ELECTRIC FIELD, by David J. Rose and Sanborn C. Brown. Jan. 22, 1952. 9p. (NP-3814; Technical Report No. 223; U22070)

NP-3815 4111
Research Lab. of Electronics, Mass. Inst. of Tech.
METHODS OF MEASURING THE PROPERTIES OF IONIZED GASES AT HIGH FREQUENCIES. I. MEASUREMENTS OF Q, by Sanborn C. Brown and David J. Rose. Jan. 22, 1952. 18p. (NP-3815; Technical Report No. 222; U22085)

NP-3817 4019
Pomona Coll.
COMPUTATION OF PORE SIZES FROM PHYSICAL ADSORPTION DATA, by Conway Pierce. Apr. 1952. 16p. (NP-3817; U21936)

NP-3818 4071
Battelle Memorial Inst.
THE WELDING OF BETA-STABILIZED TITANIUM ALLOYS; PROGRESS REPORT, by G. E. Faulkner, G. B. Grable and C. B. Voldrich. Mar. 18, 1952. 12p. (NP-3818; U22104)

NP-3820 4280
Spectroscopy Lab., Pennsylvania State Coll.
TECHNICAL REPORT FOR THE PERIOD MAY 1, 1951 – MAY 1, 1952. [nd] 72p. (NP-3820; U22043 to U22050)

NP-3825 4179
Solid State and Molecular Theory Group, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT NO. 4. Apr. 15, 1952. 26p. (NP-3825; Quarterly Progress Report No. 4; U22051)

NP-3829 4021
Mallinckrodt Chemical Lab., Harvard Univ.
THE MICROWAVE SPECTRUM AND STRUCTURE OF METHYLENE FLUORIDE, by David R. Lide, Jr. [nd] 15p. (NP-3829; U21849)

NP-3830 4015
Wisconsin Univ.
EXTRACTION OF ZIRCONIUM AND HAFNIUM WITH VARIOUS β DIKETONES; TECHNICAL REPORT IV, by Edwin M. Larsen and Glenn Terry. May 1, 1952. 6p. (NP-3830; U22135; Technical Report IV)

NP-3852 4053
Stanford Univ., Div. of Engineering Mechanics
COMBINED STRESS EXPERIMENTS IN PLASTICITY, by Aris Phillips. Jan. 15, 1952. 26p. (NP-3852; Technical Report No. 11; U-20919)

NP-3871 4075*
Cryogenic Lab., Ohio State Univ.
THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF THE GROUP VI ELEMENTS: TUNGSTEN (WOLFRAM), MOLYBDENUM AND CHROMIUM, by Esther Richert, C. W. Beckett, and H. L. Johnston. Dec. 1, 1949. 80p. (NP-3871; Technical Report No. 102-AC49/12-100)

NP-3873 4070*
Brown Univ., Graduate Div. of Applied Mathematics
STRESS-STRAIN RELATIONS IN THE PLASTIC RANGE – A SURVEY OF THEORY AND EXPERIMENT and BIBLIOGRAPHY, by D. C. Drucker. Dec. 1950. 312p. (NP-3873; U16947; U16948; Report No. A11-S1)

NP-3874 4230
Institute for Nuclear Studies, Univ. of Chicago
THE UNIVERSITY OF CHICAGO 170-INCH SYNCHRO-CYCLOTRON; JULY 1950 – JANUARY 1952 (Final Report), by Herbert L. Anderson, John Marshall, Lester Kornblith, Jr., Richard H. Miller, and Leroy Schwarcz. [nd] 51p. (NP-3874)

NP-3891 4091*
Central Aerosol Labs., Columbia Univ.
PROGRESS REPORT NO. 6 COVERING PERIOD FROM FEBRUARY 28, 1951 TO MAY 31, 1951. INVESTIGATION OF PARTICLE SIZE BY DIFFERENTIAL SETTLING, by Joseph Benedict and FORWARD ANGLE SCATTERING CAMERA FOR THE STUDY OF SIZE-FREQUENCY DISTRIBUTION OF AEROSOL, by Pui-Kum Lee. [nd] 18p. (NP-3891; Progress Report No. 6; ATL-117053)

NP-3892 4043*
Colloid Research Labs., Columbia Univ.
INVESTIGATION OF PARTICLE SIZE BY DIFFERENTIAL SETTLING-FORWARD ANGLE SCATTERING AEROSOL CAMERA; MAY 31 THRU AUGUST 31, 1951, by Joseph T. Benedict and P. K. Lee. Aug. 31, 1951. 11p. (NP-3892; ATI-122991; Progress Report No. 7)

NP-3901 4045
Stanford Univ.
LOSS COEFFICIENTS FOR ABRUPT CHANGES IN FLOW CROSS SECTION WITH LOW REYNOLDS NUMBER FLOW IN SINGLE AND MULTIPLE TUBE SYSTEMS, by W. M. Kays. Jan. 1, 1950. 29p. (NP-3901; Technical Report No. 9; U-9356)

TCIR-591 4279
Chemical and Radiological Labs., Army Chemical Center
TOTAL LINEAR ABSORPTION COEFFICIENTS OF VARIOUS TYPES OF MEDIA FOR GAMMA RADIATION; INTERIM REPORT, by John A. Pierce, Jr. and Paul M. James. Nov. 8, 1951. 26p. (TCIR-591)

U-19540 4059
Naval Engineering Experiment Station, Annapolis
CHEMICAL CORROSION TESTS OF WELDED SAMPLES OF TYPE 347 STAINLESS STEEL (Supplementary report), by H. C. Ellinghausen. May 15, 1951. 3p. (U-19540; EES Report No. 4A(12)966870)

NUCLEAR SCIENCE ABSTRACTS

Vol. 6 July 31, 1952 No. 14

GENERAL

ATOMIC BOMBS AND WARFARE

3880

ATOMIC BOMBS AND MEDICAL PROBLEMS. Gerh. Rundberg. Svenska Läkartidn. 48, 2985-3012(1951) Dec. 14. (In Swedish)

A general discussion of the effects of atomic bombs and the medical problems arising from an atomic attack is presented, the information being taken from the published literature.

BIOLOGY AND MEDICINE

3881

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF FEBRUARY 28, 1952, by Sergey Shewchuck. Apr. 30, 1952. 5p. (UCRL-1793)

Los Alamos Van de Graaff Machine. J. L. McKibben. Operational aspects of the Los Alamos Van de Graaff are discussed. Control of Red Cell Production in the Animal Body. D. C. Van Dyke. Brief report is made of experiments designed to discover the agent responsible for stimulating red-cell production. High-altitude tests on hypophysectomized rats indicated that ACTH increased red-cell production. Although ACTH gave the correct response, it was concluded that it was not the answer since adrenalectomy did not affect the normal response to altitude, nor was the adrenal enlarged when the animal was kept at high altitude. The final conclusion reached is that the ACTH used in these experiments must be contaminated with a specific pituitary hormone which has nothing to do with the adrenal but does affect the bone marrow. This hormone is in the process of being isolated by purification and separation of the commercial ACTH preparations.

3882

Argonne National Lab.

PORTABLE EQUIPMENT FOR COLLECTING EXCRETA ON AN OUTPATIENT BASIS, by William B. Looney and William P. Norris. May 1952. 7p. (AECU-2044; UAC-565)

Equipment used in the collection of excreta on an outpatient basis is shown with a brief description of its use and an excretion unit designed for separate collection of urine and fecal specimens is described.

3883

Los Alamos Scientific Lab.

REVISED SEDIMENTATION CONSTANTS FOR FIBRINOGEN DETERMINED AT VARIOUS TEMPERATURES AND SPEEDS OF ROTATION, by Virgil L. Koenig and J. D. Perrings. [nd] 8p. (AECU-1568(Rev.); LADC-1023(Rev.))

Corrections are reported for the numerical errors which appeared in report AECU-1568. An abstract of report AECU-1568 appeared in Nuclear Science Abstracts as NSA 5-4938.

3884

Biophysical Lab., Harvard Medical School

ELECTROLYTE SECRETION IN THE PANCREAS, by A. K. Solomon. [nd] 24p. (AECU-2054)

The literature concerning electrolyte secretion in the pancreas is reviewed and summarized. Topics discussed include morphology of the pancreas, the composition of pancreatic juice, the effect of pressure relations within the pancreas upon pancreatic secretion, the source of the ions found in pancreatic juice, the permeability of the pancreatic cell, a working hypothesis for the mechanism of pancreatic secretion, and energy required for pancreatic secretion. 30 references.

3885

IMPROVED APPARATUS AND TECHNIQUE FOR ELECTROMAGNETIC DETERMINATION OF BLOOD FLOW. Alexander Kolin. Rev. Sci. Instruments 23, 235-42(1952) May.

The paper describes improvements in the method of measuring blood flow by electromagnetic induction in intact blood vessels left in their normal place. "Pick-up sleeves" and "occlusion cuffs" are described which can be implanted permanently into the animal without causing irritation. A method of finding the optimum position of the blood vessel in the magnetic field and of determining the strength of the utilized magnetic field component is outlined. It is shown that calibration of individual blood vessels is unnecessary; a given apparatus is calibrated once and for all by one single flow measurement in vitro. The design of the compensator is simplified. A method for compensating disturbances encountered with blood vessels which are agitated in the magnetic field is described. Various sources of electromagnetic disturbances and means of eliminating them are discussed. (auth)

3886

BEHAVIOR OF RADIUM IN PLANTS AND SOILS. K. Kaindl. Bodenkultur 5, 425-36(1951). (In German)

Experiments with fertilizer containing Ra showed that the Ra uptake by plant systems is of the order of magnitude of 10^{-12} g/g of dry plant substance and that uptake through the roots is largely independent of the plant type. Plants possess saturation limits for Ra storage which result from general absorption laws. The tolerance limits for human consumption are not exceeded by this storage.

3887

TECHNIQUE FOR EXPOSING GRASSHOPPER NEUROBLASTS TO BETA-RAYS. Mary Esther Gaulden, C. W. Sheppard, and Herman Cember. Nature 169, 228(1952) Feb. 9.

Mechanical details of an apparatus for exposing grasshopper embryos to radiation from P^{32}-bakelite plaques are illustrated. An accurate determination is possible of the amount of radiation to which the cells have been exposed. Maximum protection is provided the operator.

RADIATION EFFECTS

3888

Atomic Energy Project, Western Reserve Univ.

MONTHLY PROGRESS REPORT FEBRUARY, 1952, by Hymer L. Fridell. [nd] 9p. (NYO-1644)

From data obtained from a study of 60 rats splenectomized 5 days before exposure to x radiation varying from 458 r to 655 r, and comparison with control animals, it was concluded that the radiation sensitivity of the spleen is not markedly different from that of other hematopoetic tissues. Sub-total hepatectomy increased the deposition of Au^{198} in the femur to two or three times that of the normal rat; however, the mortality of test animals receiving 18 μc/g colloidal Au^{198} was 90% as compared to 45% in control animals receiving 36 μc/g of colloidal Au^{198}. Antibiotic therapy of rats receiving 40 μc/g of colloidal Au^{198} and of rats receiving 786 r of x radiation delayed but did not alter the 30-day mortality in either group. Nitrogen mustard was found to be incompletely additive when combined with P^{32} or Au^{198}. A greater reduction in combined toxicity was observed with P^{32} than with Au^{198}. Protective effects of propylene glycol against radiation injuries in rats were not found to be significant. Protective mechanism studies at the cellular level showed protection of yeast against radiation injuries by cysteine, monothioglycerol and glycerin in some concentrations. The survival of dogs given 700 r total body x radiation was not found to be significantly increased by the cross-circulation of their blood with that of donor dogs, whether the latter were previously exposed to 300 r x radiation with or without their spleens shielded.

3889

Massachusetts Inst. of Tech.

QUARTERLY PROGRESS REPORT FOR PERIOD JANUARY 1, 1952 TO MARCH 31, 1952, by Bernard E. Proctor and Samuel A. Goldblith. Apr. 1, 1952. 29p. (NYO-3338)

Standard operating procedures for food sterilization experiments using a Co^{60} source are reviewed. Schematic diagrams and photographs of the Co^{60} source and the food irradiation building are included. Calibration of the Co^{60} source, and preliminary studies of the effects of Co^{60} radiations on Escherichia coli and comparative effects of Co^{60} radiations with 3 Mev cathode rays on solutions of ascorbic acid are discussed.

3890

Atomic Energy Project, Univ. of Calif., Los Angeles

PRODUCTION OF PHENOCOPIES IN AEROBACTER AEROGENES BY ULTRAVIOLET RADIATION, by Amos Norman. May 14, 1952. 21p. (UCLA-200)

Ultraviolet radiation induces the formation of phenocopies in A. aerogenes characterized by their inability to grow in media containing as sole carbon source any one of the following compounds: acetate, citrate, succinate, lactose, or rhamnose. Each of these is an adaptive substrate for cultures grown in glucose, and this suggests that the radiation blocks the adaptive mechanism in some way. Such an hypothesis is supported by the finding that the formation of phenocopies unable to utilize any one of these compounds can be suppressed by first adapting the bacterial population to that compound. An analysis of the survival curves indicates that the ultraviolet inactivation of the bacteria, in general, and the formation of phenocopies, in particular, is a consequence of some alteration in the bacterial nuclei. (auth)

3891

Oak Ridge National Lab.

EVIDENCE FOR SISTER-STRAND CROSSING OVER IN MAIZE (abstract), by Drew Schwartz. [nd] 1p. (AECU-2031)

A large ring chromosome involving almost the whole of chromosome 6, the nucleolar organizer chromosome, was induced by x irradiation of maize pollen. Gametophytes possessing the ring and thus deficient for the chromatin in the terminal regions of chromosome 6 are viable. Crossing over in the heterozygote between the ring and its homologous rod chromosome results in bridges in both A_I and A_{II}. Cytologically it is possible to recognize two double crossover types. A four-strand double exchange gives rise to a double bridge in A_I; three-strand double (type b) in which a rod chromatid is involved in both exchanges gives a single bridge in both A_I and A_{II}. The frequency of single bridges in A_{II} was found to be approximately 3 times the frequency of double A_I bridges. It was possible to rule out negative chromatid interference. The data indicate that approximately 50 % of the single exchange bivalents, which theoretically should give rise to single bridges in A_I only, also form single bridges in A_{II}. This can be accounted for by sister-strand crossing over. A single non-sister crossover associated with a sister-strand crossover in the ring will give rise to the same anaphase configuration which results from a three-strand double crossover of type b. The proportions of the four classes of anaphase configurations resulting from double non-sister crossovers are not changed by the occurrence of sister-strand crossing over. The high frequency of dicentric double ring formation in meiosis also suggests sister-strand crossing over. (Entire report. Abstract of paper for meeting of Genetics Soc. of America, Sept. 8 to 10, 1952).

3892

Oak Ridge National Lab.

THE ROLE OF EXTERNALLY PRODUCED HYDROGEN PEROXIDE IN THE ACTION OF X RAYS UPON PARAMECIUM AURELIA (abstract), by R. F. Kimball and Nenita Gaither. [nd] 1p. (AECU-2032)

Nongenetic death and division delay in Paramecium are produced by 50 to 400 kr of x rays depending on the medium and other conditions. Irradiation in a medium in which accumulation of H_2O_2 was prevented by living bacteria or by catalase was less effective than irradiation in a medium containing small amounts of organic matter but no living bacteria or catalase. Irradiated medium of the latter kind produced death and division delay in paramecia added after irradiation. The doses required were only slightly, if at all, greater than those which, given directly to the animals, produced an equivalent biological effect. The activity of irradiated medium was destroyed by catalase and tests for H_2O_2 were positive. The amount of H_2O_2 found was two-thirds to three-quarters that which, added directly, produced an equivalent biological effect. Thus a large part of the action of irradiated medium can be attributed to H_2O_2 although some must be brought about by other mechanisms. The medium in which the paramecia were irradiated had no influence on the amount of mutation nor were mutations induced in detectable amounts by sublethal exposures to H_2O_2 or irradiated medium. Thus the large number of mutations induced by direct irradiation with doses of this magnitude must have been due to energy absorbed in the animals. It is not clear whether substances produced in the medium are not mutagenic or cannot penetrate to the micronuclei. (Entire report. Abst. of paper for meeting of Genetics Soc. of America, Sept. 8-10, 1952).

3893

Cancer Research Inst., New England Deaconess Hospital, Boston

RADIATION REACTIONS IN PARABIOTIC RATS, by Joshua L. Edwards and Sheldon C. Sommers. [nd] 23p. (AECU-2056)

A study was made of morphologic tissue changes and leukocyte counts after ionizing radiation, using parabiotic rats. One member was protected from x rays by a lead shield, and the other member given a single dose of 400, 800, 1200 or 1600r total body x radiation. Vascular connections were proved using P^{32} labeled erythrocytes and T 1824 dye. No pathologic evidence of radiation damage to the protected rats was found such as might be mediated by circulating substances. Increased resistance of parabionts to irradiation of

one member was indicated by less marked leukopenia than in irradiated single rats, and the protected rats' leukocytes appeared to bolster the irradiated partners. Intestinal, lymphoid and hematopoietic tissues of the protected partners often showed brief periods of hyperplasia post-irradiation. This was more frequently observed in hemi-adrenalectomized parabionts. Ovarian granulosa cells and testicular spermatocytes also sometimes became hyperplastic in protected rats without relation to adrenalectomy. No differences in radiation reactions were observed ascribable to adrenalectomy. Ionizing radiation damage appears to have in common with the "alarm reaction" mainly an inhibition of protein resynthesis following increased tissue breakdown. (auth)

3894

Los Alamos Scientific Lab.

THE PROTECTIVE EFFECT OF SHIELDED ECTOPIC BONE MARROW AGAINST TOTAL-BODY X-RADIATION, by J. B. Storer, C. C. Lushbaugh, and J. E. Furchner. [nd] 28p. (AECU-2039; LADC-1166)

Lead shielding of small amounts of ectopic marrow induced in the tails of rats by abdominal implantation increased survival of rats exposed to 650 r of total-body x radiation. Shielding of normal tails containing fatty marrow did not increase survival, indicating that marrow cells per se rather than other tissues unavoidably shielded are responsible for increased survival in bone-shielding experiments. Implantation of shielded normal tail into the abdomen following irradiation did not increase survival of rats because of the slowness with which ectopic marrow develops from fatty reticulum. There was no significant difference in the changes in hemoglobin values, white blood counts, or radio-iron uptake of rats irradiated with or without shielding of ectopic marrow. No histological evidence of increased regeneration of bone marrow or of ectopic hematopoiesis was found in the shielded rats. The fact that survival was increased in the absence of evidence of increased marrow regeneration indicates that survival in animals irradiated with shielding of hematopoietic tissue does not depend on a more rapid rate of recovery of the unshielded bone marrow. (auth)

3895

Yale Univ.

PROGRESS REPORT FOR MARCH 1, 1951 – MARCH 1, 1952, by Ernest C. Pollard. Issued Mar. 28, 1952. 120p. (NYO-4004)

Progress is reported on the following research projects: the nature of the biological action of ionizing radiation; ionizing particle evidence for the molecular weight of the pneumococus transforming principle; the radiation sensitivity of catalase as a function of temperature; determination of the molecular weight of insulin from deuteron bombardment; determination of the molecular weight of alpha amylase; the inactivation of bacteriophage and catalase by soft x rays; a study of enzymes and enzyme inhibitor compounds; the action of x rays on germinating spores of B. subtilis; low voltage electron bombardment of bacterial spores; the inactivation of monomolecular layers of bovine albumin with deuterons; and the inactivation of bulk bovine albumin. A list of reports based on these research projects, both published and in the process of publication, is included.

3896

Tennessee Univ.

QUARTERLY PROGRESS AND WORK ACCOMPLISHMENT REPORT FOR QUARTER ENDING MARCH 31, 1952. [nd] 30p. (ORO-68)

Progress is reported in the following research projects: fission product metabolism in animals, in which tissue distribution studies of Sr and Cs are reported; Ca metabolism in animals, in which absorption and internal distribution and the interrelationships with minerals, vitamins, hormones, and other factors were studied; radiation effects on reproductive functions in farm animals, in which sperm physiology studies are reported; the use of radioisotopes in the investigation of the physiology of milk secretion; the behavior and fate of radioactive Ca after its incorporation in the soil; and external radiation studies with large animals, in which data are included from a study of the lethal dose of whole-body Ta^{182} γ irradiation for the burro and clinical observations upon the response of the burro to large doses of external whole body γ irradiation.

3897

NASOPHARYNGEAL RADIUM TREATMENT; A FOLLOW-UP STUDY OF 263 PATIENTS. Walter E. Loch and Newton D. Fischer. Ann. Otol. Rhinol. Laryngol. 61, 198-206(1952) Mar.

No late detrimental effects of irradiation or any other visible tissue pattern that could be explained as due to the application of radium have been found in any of the 85 patients who have been re-examined from three to 29 years after radium treatment of the nasopharynx. (auth)

3898

ACTION OF NEUTRONS ON ENZYMATIC ACTIVITY. Kurt Jacobsohn and Marieta da Silveira. Arch. portugaises sci. biol. 10, Suppl., 110-11(1950), reprinted in Trav. lab. Inst. Rocha Cabral (Lisbon) 19 (1951). (In French)

Aqueous fumaric hydratase was not inactivated by exposure to a Ra-Be neutron source moderated by 10 cm of paraffin. It is concluded that only fast neutrons decrease enzymatic activity. Exposure to the unmoderated source slowly inactivated alkaline serum phosphatase and serum cholinesterase.

3899

ACTION OF RADIUM AND NEUTRON-SOURCE RADIATIONS ON ENZYMATIC ACTIVITY. Kurt Jacobsohn and Marieta da Silveira. Arch. portugaises sci. biol. 10, Suppl., 105-6 (1950), reprinted in Trav. lab. Inst. Rocha Cabral (Lisbon) 19 (1951). (In French)

Fumaric hydratase in liver extract was not inactivated by prolonged Ra or x radiations but was completely inactivated by a 5-day exposure to an unmoderated Ra-Be neutron source. Thiaminase in fern-leaf extract was not inactivated by either Ra or neutron source.

3900

INVESTIGATION OF THE MECHANISM OF ENZYMATIC INACTIVATION BY NEUTRONS. Kurt Jacobsohn and Marieta da Silveira. Arch. portugaises sci. biol. 10, Suppl., 112-13(1950), reprinted in Trav. lab. Inst. Rocha Cabral (Lisbon) 19 (1951). (In French; cf. NSA 6-40)

Dry fumaric hydratase, prepared by precipitating liver extract with acetone and ether, was not inactivated by irradiation with fast neutrons for the same period of time that completely inactivated the aqueous enzyme. A secondary inactivation effect is attributed to the irradiation products of water.

3901

MONOCYTIC LEUKOSIS FOLLOWING CHRONIC ROENTGEN-RADIUM INJURY. F. Leibetseder. Med. Klin. (Munich) 47, 46-8(1952) Jan. 11. (In German)

A radiologist exposed for 20 yr to x rays and Ra developed acute leukoblastosis (monocytic leukemia of the Hittmair type). The illness began as panmyelopathy with megaloblastic anemia. There was continual enlargement of the white cells of the monocytoid type. Death resulted in 6 months. The blood and bone-marrow picture is described in some detail.

3902

POT EXPERIMENTS WITH RADIOACTIVE FERTILIZER. H. Linser and W. Pelikan. Bodenkultur 5, 417-24(1951). (In German)

A possible beneficial effect of radiation on plant growth was sought by using fertilizer containing various amounts of Ra. No positive results were observed.

3903
KINETICS OF APPEARANCE OF NEUTROCYTES WITH KARYOSCHISIS AFTER WHOLE-BODY IRRADIATION WITH A SINGLE DOSE OF X RAYS. Jean-François Duplan. Compt. rend. 234, 2020-2(1952) May 12. (In French)

Adult male guinea pigs were x irradiated with 10 to 1100 r, and the relative and absolute increases of polynuclear neutrophils exhibiting karyorrhexis of the nuclei were studied. The rate of increase was greater and the maximum was obtained earlier the greater the x-ray dose. The minimum dose necessary to cause an increase is between 10 and 25 r for guinea pigs.

3904
EFFECTS OF X-RAY RADIATION ON PANCREATIC FUNCTION IN DOGS. Robert F. Rauch and K. Wilhelm Stenstrom. Gastroenterology 20, 595-603(1952) Apr.

The volume of pancreatic secretion decreased temporarily in five dogs with pancreatic fistulas following irradiation. In a few instances there appeared to be a subsequent secondary increase above normal. No definite alteration of the alkalinity of the juice was noted following 400 to 1000 r of irradiation. In all instances, roentgen therapy with an exposure of 400 or 600 r had a definite depressive effect on the amylase, lipase, and trypsin output of the pancreas. In general, this effect occurred following a 12 to 36 hour delay and the period of depression was limited to a few days in each animal studied. Similar findings were noted with a second exposure to irradiation. The changes observed in regard to the amylase, lipase, and trypsin outputs were similar and parallel to each other except for a more persistent depression of trypsin following a second period of irradiation. No organic changes were found histologically in any abdominal organ subsequent to single exposures to 600 r or following repeated exposures of 200 r on alternate days for totals of 800 and 1600 r. (auth)

3905
ACTION OF WHOLE-BODY X IRRADIATION ON THE SYNTHESIS OF MUSCULAR GLYCOGEN IN THE GUINEA PIG. Marguerite Lourau and Odette Lartigue. Compt. rend. 234, 2022-4(1952) May 12. (In French)

Sublethal x irradiation did not modify glycogenesis in guinea pig muscles, provided the diet was normal. In fasted animals, the muscle glycogen was lowered by the irradiation. The diminution was not so general nor so important as that observed, under the same conditions, in the liver.

3906
THE COAGULOGRAM AFTER SPLEEN IRRADIATION. Helmut Wagner. Gynaecologia 133, 194-204(1952) Apr. (In German)

In 76.7% of cases, comparative studies of blood coagulation in x irradiation of the spleen (indication: gynecological hemorrhages) and of mastitis showed acceleration of coagulation with hemostyptical effect after irradiation of the spleen. The cause was found in the behavior of several important factors in coagulation: (1) Increased liberation of thrombocytic thrombokinase (through disruption of thrombocytes) and tissual thrombokinase (through disruption of lymphocytes and leucocytes). (2) Increase of prothrombin and accelerator-globulin synthesis in the liver through decrease of the antithrombin content (explanation: irradiation of the spleen causes a transitory inhibition of th the spleen, whereby the liver takes over part of the function of the spleen and in this additional work synthetizes more prothrombin and accelerator-globulin). (3) No substantial increase of fibrogen content in the plasma. The failures of irradiation of the spleen can be explained as individual differences of sensitivity to irradiation. (auth)

3907
THOROTRAST DAMAGE IN BRONCHOGRAPHY, RETROGRADE PYELOGRAPHY, SALPINGOGRAPHY, AND ARTERIOGRAPHY. J. Vögtlin and W. Minder. Radiologia Clin. 21, 96-115(1952) Mar. (In German)

Clinical reports on the changes caused by thorotrast (colloidal ThO_2) in four patients are presented. Changes in lungs, kidneys, serosa, liver, spleen, and mediastinal lymph glands are described. A squamous epithelioma was present in the lungs in one case in addition to typical thorotrast granulomas.

3908
NIL NOCERE! THE QUESTION OF PETEOSTHOR DAMAGE. Ernst L. Schäfer and Hans Greuel. Münch med. Wochschr. 94, 158-62(1952) Jan. 25. (In German)

A 19-yr-old girl was treated with a series of intravenous injections of Peteosthor (eosin-stabilized, ThX (Ra^{224})-containing platinsol) for tuberculosis of the knee joint. Total dosage was 15,000 esu. Development of myeloid leukemia led to death 1 yr following conclusion of the treatments. Residual α activity was found in liver and bones. The possibility of radiation damage in the therapeutic use of Peteosthor is discussed.

3909
BEHAVIOR OF OXYGEN CONSUMPTION BY THE HUMAN GASTRIC MUCOSA IRRADIATED IN VITRO WITH SMALL DOSES OF X RAYS. Marsili and Paoletti. Radiologia Med. 37, 948-9(1951) Nov. (In Italian)

Human gastric mucosa was x-irradiated with 1, 2, 5, or 10 r in vitro. O_2 consumption was measured with a Warburg manometer. The inhibiting, enhancing, variable, and time effects noted are outlined.

3910
EFFECT OF WHOLE-BODY X-IRRADIATION OF THE GUINEA PIG ON UTILIZATION OF GLUCOSE BY THE LIVER. M. Lourau and O. Lartigue. J. physiol. et path. gen. 43, 593-603(1951). (In French)

Male guinea pigs weighing 400 to 500 g were irradiated sublethally with 500 r of 180-kv x radiation. Hepatic glycogenesis was observed to be deficient. This deficiency was manifested less by a diminution in the quantity of glycogen formed in the course of glucose absorption than by the impossibility of preserving the stocks of glycogen during the period following absorption. The authors hypothesize that irradiation does not affect the direct synthesis of glycogen from alimentary glucides, but impedes synthesis from small molecules.

RADIATION HAZARDS AND PROTECTION

3911
Lovelace Clinic, Albuquerque, New Mexico
BILATERAL LENTICULAR OPACITIES OCCURRING IN A TECHNICIAN OPERATING A MICROWAVE GENERATOR, by Frederic G. Hirsch and John T. Parker. [nd] 8p. (AECU-2041)

A case study of the damage done to the eyes of an adult male upon exposure to microwave radiation is reviewed. Since microwave energy has been used as a modality of physical therapy for a number of years without any record of ocular damage, this case study was published to recall to the attention of the ophthalmologists, industrial physicians, and microwave operators the potentialities of microwave radiation, in order that the use of this form of energy will be accompanied by appropriate respect and precautions.

3912
THE KRYPTOMETER, A NEW RADIATION PROTECTION MEASURING DEVICE. H. Eberhardt and R. Jaeger. Fortschr. Gebiete Röntgenstrahlen 76, 382-9(1952) Mar. (In German)

The "kryptometer" described was developed to combine the advantages of the screen method with those of a quan-

timeter. The screen of the kryptometer gives a general view of the dispersion of the vagrant rays, but at the same time it is possible to determine the dose efficiency by photometry at any desired place. With the aid of added Al and Cu standard filters the half-value layer can be measured sufficiently exactly. The practical measurements led to the conclusion that for routine measurements for irradiation protection the kryptometer may compete seriously with more complicated apparatus without their disturbing mechanical sensitiveness, isolation failures, or dark effects. Even if the time constancy of the apparatus needs detailed trial, a permanent control of the sensitiveness is not necessary. Thus the fluorescent-screen method may prove its utility in the described form in combination with other apparatus. (auth)

3913

SUBSTANCES WITH PROTECTIVE EFFECT AGAINST THE ACTION OF IONIZING RADIATION. Paoletti. Radiologia Med. 37, 946-8(1951) Nov. (In Italian)

A brief address superficially recounts recent progress in radiation prophylaxis. No references except investigators names are given.

3914

THE CONCEPT OF A MAXIMUM PERMISSIBLE EXPOSURE. Robert S. Stone. Radiology 58, 639-61(1952) May.

Biological effects of radiation are reviewed and a concept is presented for establishing maximum permissible exposure limits which is based on a large number of experiments and observations.

3915

EFFECT OF SODIUM SALICYLATE ON RESISTANCE OF MICE IRRADIATED WITH X RAYS. H. Betz and H. van Cauwenberge. Compt. rend. soc. biol. 145, 1910-13(1951) Dec. (In French)

Adult C57 mice were injected intraperitoneally with 12 daily doses of 400, 500, or 600 mg of Na salicylate/kg, then were irradiated with 700 r of 250-kv x rays. Survival rates were 25, 55, and 50%, respectively, compared to zero for controls. Injection with 500 mg/kg daily following a 700-r irradiation resulted in much more rapid death than among the controls, all dying within 6 and 12 days, respectively. A stimulating action of Na salicylate on the adrenal cortex is suggested to explain these results.

3916

PROTECTION OF AN ENZYME AGAINST THE DESTRUCTIVE ACTION OF NEUTRONS. Marieta da Silveria and M. Deodata Azevedo. Arch. portugaises sci. biol. 10, Suppl., 114-16(1951), reprinted in Trav. lab. Inst. Rocha Cabral (Lisbon) 19 (1951). (In French)

The presence of Na_2SO_3 prevented inactivation of aqueous fumaric hydratase by a Ra-Be neutron source, whereas the presence of L-cysteine had no protective effect. The Na_2SO_3 increased the enzymatic power of the hydratase both before and after irradiation.

3917

CONCERNING RECENT RESEARCH ON PROTECTION AGAINST HIGH-INTENSITY WHOLE-BODY EXPOSURE TO PENETRATING RADIATIONS. A. Lacassagne. Fortschr. Gebiete Röntgenstrahlen 75, Suppl., 98-105(1951) Dec. (In French)

The author reviews the investigations carried out since 1909 on chemical prophylaxis and treatment of radiation sickness and describes an experiment of his own in which adult rats were injected with Loiseleur's solution (glucose, cysteine, thiourea, ascorbic acid, and succinic acid) 15 min before or after x irradiation with 666 to 836 r. Histological observations are reported briefly. The lower mortality of the treated animals is apparently caused by survival of a greater number of stem cells in the hematopoietic tissue. 53 references.

RADIATION SICKNESS

3918

THE HEMORRHAGIC PHASE OF THE ACUTE RADIATION SYNDROME DUE TO EXPOSURE OF THE WHOLE BODY TO PENETRATING IONIZING RADIATION. E. P. Cronkite, G. J. Jacobs, George Brecher, and George Dillard. Am. J. Roentgenol. Radium Therapy 67, 796-804(1952) May.

The pathogenesis of the hemorrhagic state has been approached by analyzing the current knowledge and presenting new data on various phases of the known hemostatic mechanisms in the dog. From an analysis of the confirmed work it is evident that ulceronecrotic lesions and infections play a prominent role in initiating hemorrhage. Once initiated, the thrombopenic animal has difficulty in stopping the outflow of blood from eroded vessels. The development of the purpura is still not entirely explained. All thrombopenic animals do not become purpuric. Some other factor apparently precipitates the widespread purpura. The precipitation of the diffuse purpura is frequently correlated with sepsis. The blood coagulation defect and the failure to utilize prothrombin can be directly correlated with the platelet deficiency and is corrected by platelets in vivo and in vitro. To date, no other agent has accomplished this. There is no good evidence for a deficiency of any of the plasma factors essential for blood coagulation except those connected with the platelet. However, this does not rule out the possibility of other as yet unidentified factors playing a significant role in the hemorrhagic syndrome. Indirect indications of inhibitors have been noted in this laboratory from time to time as well as other, at present inexplicable, complex, disburbances of coagulation. For example, it is necessary to increase the platelet level of the thrombopenic dog to a much higher level than anticipated to obtain results equivalent to the in vitro studies. (auth)

3919

TREATMENT OF ROENTGEN SICKNESS WITH AVIL AND VITAMINS. C. Montag. Therap. Gegenwart, No. 4, 148-9 (1952). (In German)

Clinical use in 250 patients of "Avil," a proprietary antihistamine, in the form of 25-mg tablets 3 or 4 times daily, and of large injections of vitamins C, B_1, B_6, B_{12}, and nicotinic acid mixtures in the treatment of radiation sickness is related. Good results are said to have been obtained, although data are not given.

3920

EXAMPLE OF THE ACUTE RADIATION SYNDROME IN MAN. L. H. Hempelmann. New Engl. J. Med. 206, 776-82 (1952) May.

Abstracts of the case histories of three persons exposed to single doses of varying magnitudes of total body ionizing radiation (primarily neutrons and gamma rays) are presented. These cases serve to illustrate the lethal, sublethal, and asymptomatic forms of the acute radiation syndrome. Although the exposures occurred as a result of inadvertent nuclear reactions (atomic explosions on a very small scale) the injuries were due solely to ionizing radiations. Flash burns and traumatic injuries due to heat and blast (such as were noted in 85 to 95% of the Japanese victims of the atomic explosions) were not produced in these patients. (auth)

3921

FIRST CLINICAL TESTS OF A CHEMICAL PROTECTOR AGAINST X RADIATION. A. Herve. Rev. méd. Liège 7, 276-9(1952) May. (In French)

β-Mercaptoethylamine, $HSCH_2CH_2NH_2$, has low toxicity (LD_{50} = 0.35 mg/g for mice) and high protective action against radiation (3 mg intraperitoneally before irradiation will protect 90% of mice against 700 r and 30% against 900 r). The present paper reports clinical observations on 12 patients with already developed typical symptoms of radiation sickness from massive doses of radiation. Treatment

with β-mercaptoethylamine in well-tolerated series of 200-mg intravenous doses improved certain of the symptoms.

RADIOGRAPHY

3922

Wisconsin Univ. Medical School

AN IMPROVED HISTORADIOGRAPHIC APPARATUS, by J. J. Clemmons and M. H. Aprison. [nd] 21p. (AECU-2050)

An instrument is described for quantitative historadiography, a method whereby the mass of biological structures as small as one micron in diameter can be determined. The improved apparatus enables ten historadiographs to be taken within an hour. The versatility of the apparatus, and ease of operation, suggest a wide application for its use in pathology and histochemistry. (auth)

3923

AUTORADIOGRAPHY. Geoffrey H. Bourne. Biol. Revs. Cambridge Phil Soc. 27, 108-31(1952) Feb.

Four autoradiographic techniques, the contact method, stripping-film technique, coating with melted emulsion, and mounting the section directly on the emulsion, are described in step-by-step detail. Some results of autoradiography applied to tracer localization in bones, thyroid, single cells, and other tissues and organs are reviewed. 103 references.

3924

PHOTOMICROGRAPHY OF CONSTANT REGISTRY AUTORADIOGRAMS. Paul N. Wilkinson, Frank E. Hoecker, and Paul G. Roofe. J. Biol. Phot. Assoc. 20, 52-8(1952) May.

A method is presented whereby it is possible to produce two separate negatives of a constant registry autoradiogram, i.e., a photomicrograph of a nuclear track plate and another of the corresponding tissue area. By means of a wire grid installed in the camera and use of a special easel, it was possible to compare the prints made from these two negatives with a high degree of accuracy. Details are given for the necessary modification of standard equipment. The principal problems encountered in the operation of this equipment and their possible solutions are presented. The method of illumination, optical alignment, exposure calibration and the determination of magnification factors are discussed and the maintenance of a fixed magnification ratio emphasized. (auth)

RADIOTHERAPY

3925

CLINICAL EXPERIENCES IN THE DIAGNOSTIC AND THERAPEUTIC FIELD WITH RADIOACTIVE IODINE. A. Querido and P. S. Blom. Nederland. Tijdschr. Geneesk. 96, 751-62 (1952) Mar. 29. (In Dutch)

The principles of I^{131} tracer diagnosis of thyroid diseases are expounded, numerous case histories being given. The advantages of analyzing urine in four portions spread over 48 hr are stressed. I^{131} may often contribute to final diagnosis, as was found in 49 clinically doubtful cases of hypo- and hyperthyroidism. Therapy demonstrated in some thyrotoxicosis patients is discussed. The authors prefer to apply I^{131} therapy to patients over 40 to 50 yr of age, in whom surgical or medicamentous treatment might have disadvantages.

3926

1000 CURIE COBALT UNITS FOR RADIATION THERAPY. I. THE SASKATCHEWAN COBALT 60 UNIT. II. DEPTH DOSE DATA AND DIAPHRAGM DESIGN FOR THE SASKATCHEWAN 1000 CURIE COBALT UNIT. III. DESIGN OF A COBALT 60 BEAM THERAPY UNIT. IV. RADIATION MEASUREMENTS WITH THE ELDORADO COBALT 60 TELETHERAPY UNIT. H. E. Johns, L. M. Bates, T. A. Watson, D. V. Cormack, S. O. Fedoruk, D. T. Green, R. F. Errington, E. R. Epp, W. R. Dixon, C. Garrett, and A. Morrison. Brit. J. Radiology 25, 296-318(1952) June.

Activation of the Co, the loading of the unit, and design of the treatment head of the 1000-curie Co^{60} therapy unit installed in the University Hospital at Saskatoon are described. Depth dose data and a description of the diaphragm design for the unit are included. The design of a Co^{60} beam therapy unit is described which provides simple, compact, flexible, and relatively inexpensive equipment for supervoltage therapy, using Co^{60} sources delivering up to 30r/min at 1 m. Measurements of the output, backscatter, depth dose, and dosage distribution in a water phantom, obtained with this unit are described. Measurements show that the backscatter and sidescatter are low, and that the depth dose is high.

3927

THERAPEUTIC USE OF RADIOISOTOPES. E. Eric Pochin. Bull. assoc. franç. étude cancer 38, 456-63(1951). (In French)

A brief general discussion of the use of various isotopes in treatment of cancers and tumors is presented.

3928

THE FAILURE OF C^{14}-FORMATE TO AFFECT THE COURSE OF MOUSE LEUKEMIA. Howard E. Skipper, Martelia Bell, and Juanita B. Chapman. Cancer Research 12, 371-8(1952) May.

C^{14}-formate, when injected at levels of 100 to 200 μc/mouse (280 to 560 mc man-equivalent), had no perceptible effect on life span or hematopoiesis of mice with Ak_4 leukemia. Approximately 250 μc/mouse, given over a 5 months' period, had no significant effect on the development of spontaneous leukemia in Akm mice. (auth)

3929

I^{131} UPTAKE IN TREATED HYPERTHYROIDISM. Franz K. Bauer. Am. J. Med. Sci. 223, 495-502(1952) May.

Sixty patients with active hyperthyroidism or a history of past hyperthyroidism were studied by means of repeated I_{131} thyroid uptake studies. Previous observations by other investigators on the initial rapid rate of accumulation of I_{131} by the thyroid were confirmed. Treated hyperthyroid patients in remission were found to have a reduced total amount of I_{131} accumulated by the thyroid but retained their rapid rate of uptake. Several patients with suspected hyperthyroidism were studied and their thyroids found to accumulate a normal maximum amount of I_{131}, but to have a rapid rate of uptake. These patients are being followed. The importance of obtaining repeated uptake readings within 24 hours after administration of the tracer dose of I_{131}, particularly at 3 and 6 hours, is stressed. (auth)

3930

WHAT MUST THE PRACTICAL DOCTOR KNOW ABOUT ISOTOPES? H. Cramer and H. W. Pabst. Med. Klin. (Munich) 47, 1-5(1952) Jan. (In German)

The diseases treated with P^{32} and I^{131} are listed, and the literature on internal radiotherapy with these isotopes is reviewed. 24 references

3931

EFFECTIVE AND SAFE RADIATION OF THE ANTERIOR SEGMENT OF THE EYE. Eliott B. Hague. Am. J. Ophthalmol. 35, 629-36(1952) May.

The application of various radioactive substances to the anterior segment of the eye has been discussed, particularly from the standpoint of safe but effective therapy. Depth dose curves of Ra and Pb^{210} were calculated from photographic measurements. Depth dose curves of radioactive Sr and of various x-ray modalities were calculated. The Pb^{210} plaque for very superficial lesions would be expected to be as effective as the Ra plaque but lacks sufficient penetration for slightly deeper lesions. The fact that Ra in a curved applicator appears most satisfactorily to fulfill the criteria in this limited

area, for safe but effective therapy, has been commented upon. (auth)

3932
RESULTS IN THE TREATMENT OF HYPERTHYROIDISM WITH RADIOIODINE, I^{131}. Sidney C. Werner. Med. Clinics N. Amer., 623-37(1952) May.

The results of the treatment of toxic goiter at the Presbyterian Hospital from October 1, 1946, to June 15, 1951, have been summarized. Current criteria for dosage, range of individual dosage, and the factors influencing responsiveness of the gland to internal radiation effect have been outlined. Remission of toxic goiter has been achieved in about 90% of patients with toxic diffuse, toxic recurrent and toxic nodular goiter. Hypothyroidism has been induced in 6 to 8% of patients with toxic diffuse and toxic recurrent goiter, but in no instance of toxic nodular goiter. Two case histories are presented illustrating unusual resistance to internal radiation effect, and the onset of malignant exophthalmos after I^{131} therapy. The indications are outlined for the selection of I^{131} over other modalities of therapy in toxic goiter. (auth)

3933
EXPERIENCE IN THE CLINICAL APPLICATION OF RADIOACTIVE IODINE. F. Odenthal. Münch. med. Wochschr. 94, 727-35(1952) Apr. 11. (In German)

A case history illustrating the detection and treatment with I^{131} of thyroid cancer with widespread metastases is presented and discussed in detail. A second case history describes the treatment of thyrotoxicosis with I^{131}. 7 figures.

3934
ROENTGEN IRRADIATION OF COBALT POLYCYTHEMIA AS A MODEL EXPERIMENT. R. Seyss. Wien. Z. inn. Med. 33, 107-11(1952) Mar. (In German)

A large increase in number of erythrocytes was produced in white rats by subcutaneous injection of 5 mg of $CoCl_2$/kg. Subsequent 5- and 20-r whole-body irradiation was superior to the same irradiations of the skull alone in reducing the erythrocyte count. Two phases were observed in the midbrain irradiation: a neurohormonal excitation (stimulation action), then a neurohormonal depression (sedative action). Extension of these results to treatment of human polyglobulism is discussed.

3935
NEW MEANS OF RADIATION TREATMENT OF CANCER. A. Zuppinger. Praxis (Bern) 41, 277-83(1952) Apr. 3. (In German)

A general discussion (no references) of the treatment of cancer with x rays, γ rays, betatron radiation, and radioisotopes is presented. The mechanism of radiation action in cancerous tissues is considered.

TOXICOLOGY STUDIES

3936
Argonne National Lab.
COMPARATIVE CHRONIC TOXICITIES OF RADIUM AND PLUTONIUM, by A. M. Brues. Apr. 1951. 20p. (ANL-4799)

A preliminary quantitative survey is presented of the survival and gross pathologic changes in animals given Ra and Pu, and a discussion of the significance of the findings and their relation to the human toxicity problem is outlined. The toxicity ratio between Ra and Pu is evaluated from the data of a large number of experiments.

3937
Radiation Lab., Univ. of Calif.
THE BIOLOGICAL BEHAVIOR OF ORGANIC COMPOUNDS CONTAINING RADIOPHOSPHORUS, by D. C. Morrison and Josephine F. Crowley. Apr. 25, 1952. 22p. (UCRL-1759)

Representative members of six different classes of organic P compounds were synthesized containing radioactive P as a tracer. These compounds, in suitable form for biological use, were injected by parenteral routes into albino rats for the purpose of determining their fate in the animal body. After one and four day periods, the animals were sacrificed and the distribution of the tagged substances determined by counting the radioactivity of the dried and ashed tissues and organs. Conclusions concerning the biological stability of the injected materials are given where supporting experimental evidence is obtained. (auth)

3938
PULMONARY AND CUTANEOUS DISEASES CAUSED BY BERYLLIUM COMPOUNDS. Frank R. Dutra. Postgraduate Med. 2, 383-6(1952) May.

A review of the medical case against Be and Be compounds discusses their ability to produce acute pneumonitis as well as chronic disabling pulmonary disease and acute or chronic inflammation of the skin. The procedure for diagnosis and treatment of the disease is also given.

3939
TOXICITY OF RADIOIODINE AND RADIOPHOSPHORUS IN RATS IN DOSES COMPARABLE TO THOSE USED CLINICALLY. Campbell Moses, Joseph B. Boatman, Robert S. George, and Agatha M. DeLacio. Proc. Soc. Exptl. Biol. Med. 79, 343-4(1952) Mar.

Radioactive phosphorus (P^{32}) was administered by intubation to young male rats in doses equivalent to 4.6 mc, 7.0 mc and 11.6 mc for a 70 kg man. Similar radioiodine doses of I^{131} equivalent to 14.0 mc, 42, and 420 mc were given. All animals were sacrificed 6 weeks after dosing. Except for a significant decrease in the testes/body weight ratio and a moderate lymphopenia at the time of autopsy no growth curve, organ weight or histologic evidence of damage was discerned in the animals receiving P^{32}. Although no changes in weight gain or histologic evidence of organ damage was observed following the administration of I^{131}, some variations in organ weight/body weight ratio were recorded. In the doses here employed, which were comparable to those used clinically, no evidence of serious radiation damage was recorded. (auth)

3940
BERYLLIUM GRANULOMATOSIS. A. Policard. Med. lavoro 43, 66-77(1952) Feb. (In French)

The structure, mechanism, and evolution of experimental pulmonary, subcutaneous, and intraperitoneal Be granulomas in rats and guinea pigs are described. The pathological action of acid radicals of Be compounds, particularly the fluoride, is especially serious. The Be cation has a specific but weaker toxicity than the anions. It is responsible for the characteristic Be granulomatosis. When the amount of Be passes a certain level, delayed hepatic and renal alterations are produced. The Be particles are probably blocked at first by the granulomas, then dissolve progressively. Be can accumulate in certain parts of the skeleton, especially the metaphyses.

TRACER APPLICATIONS

3941
Purdue Univ.
THE RATE OF ENDOGENOUS RESPIRATION AS AFFECTED BY THE OXIDATION OF EXOGENOUS SUBSTRATES, by H. J. Blumenthal, Henry Koffler, and E. P. Goldschmidt. [nd] 8p. (AECU-2060)

A method is described for indirectly determining the O requirements for the metabolism of endogenous and exogenous materials by comparing the release of isotopically labeled CO_2 from labeled resting cells in the presence or absence of unlabeled substrates. Difficulties encountered in

the use of this method are illustrated by data from studies of the effect of glucose or acetate on the uptake of O_2 and release of $C^{14}O_2$ from cells of Penicillium chrysogenum Q-176 labeled by growth on 1- and 2-C^{14}-acetate as the main source of carbon, and studies of the effect of acetate on the uptake of O_2 and release of $C^{14}O_2$ from cells of P. chrysogenum Q-176 labeled by oxidative assimilation of 2-C^{14}-acetate.

3942

STUDIES OF TOTAL BODY WATER WITH TRITIUM. T. C. Prentice, W. Siri, N. I. Berlin, G. M. Hyde, R. J. Parsons, E. E. Joiner, and J. H. Lawrence. J. Clin. Invest. 31, 412-18(1952) Apr. 1.

Total body water has been determined with tritium-labeled water in 57 individuals. Twenty were normal and the remainder were suffering from a variety of disease states. Tritium appears to measure the same water volume as deuterium, averaging 2 to 4% higher than with antipyrine, and undergoes degree of exchange with organic molecules similar to deuterium. The difference between antipyrine and tritium body water volumes is accounted for by exchange of tritium with protein bound hydrogen. Body water determinations vary greatly from individual to individual, the variations in proportion reflecting for the most part variation in body fat. In pathologic states, where the lean body mass cannot be assumed to remain constant in composition, body water determinations are of limited value without a method for quantitating fat. (auth)

3943

USE OF ISOTOPES IN MICROBIOLOGY AND CHEMOTHERAPY. P. Benigno. Arch. ital. sci. farmacol. 22, 5-40(1952) Jan. (In Italian)

An extensive review of tracer applications in cell biology and in studies of effects of penicillin and other chemotherapeutic agents on bacteria is presented. 412 references.

3944

OBSERVATIONS ON THE SUITABILITY OF TRITIUM-LABELED CHOLESTEROL FOR THE STUDY OF CHOLESTEROL METABOLISM. Max Biggs and David Kritchevsky. Arch. Biochem. Biophys. 36, 430-3(1952) Apr.

Following the feeding of cholesterol doubly labeled with radioactive hydrogen and carbon, the ratio of tritium specific activity to C^{14} specific activity in the serum cholesterol over a 10-day period was found to correspond to the ratio of tritium specific activity to C^{14} specific activity in the material fed. These results show that tritium-labeled cholesterol is a suitable tracer compound for biological investigations of many aspects of cholesterol absorption and turnover. (auth)

3945

MEASUREMENTS OF THE DISAPPEARANCE OF RADIOACTIVE TAGGED ALBUMIN FROM SERUM AND THE EXCRETION OF I^{131} IN THE URINE OF PATIENTS WITH CIRRHOSIS. Malcolm P. Tyor, Jerry K. Aikawa, and David Cayer. Gastroenterology 21, 79-89(1952) May.

A tracer dose of iodinated serum albumin was injected into 9 patients with cirrhosis of the liver and 22 patients with various other diseases. The rate of disappearance of the tagged albumin from the vascular compartment was similar in the two groups. A significant decrease in the excretion of inorganic iodide was found during the first 24 hours in the patients with cirrhosis. (auth)

3946

A PLASMA I^{131} INDEX FOR ASSESSING THYROID ACTIVITY. H. Blondal. Brit. J. Radiology 25, 260-2(1952) May.

A simple plasma I^{131} index for assessing thyroid toxicity is described and compared with other methods of measurement. This index was determined for four cases of clinically diagnosed thyrotoxicosis, and seven non-toxic cases. It is shown that the index gives a better separation between toxic and non-toxic states than the other methods (thyroid uptake, thyroid clearance, and urinary excretion), used in this investigation. (auth)

3947

RADIOMANGANESE STUDIES ON THE MOUSE, RAT AND PANCREATIC FISTULA DOG. William T. Burnett, Jr., Robert R. Bigelow, Allyn W. Kimball, and Charles W. Sheppard. Am. J. Physiol. 168, 620-25(1952) Mar.

Radiomanganese appeared in the pancreatic juice of dogs provided with pancreatic fistulas within one half hour after intravenous administration of the isotope. Thereafter, stimulation of the pancreas by feeding increased the rate of appearance which was found to parallel that of protein nitrogen, thus suggesting that the secretion of manganese may be a normal function of the acinar cell. The congruence in the secretion patterns of manganese and protein points to an intimate relationship between the micronutrient and pancreatic enzyme systems. (auth)

3948

ISOTOPES AND ISOTOPE-LABELED MATERIALS FOR CANCER RESEARCH; AVAILABILITY AND RECENT USES. Paul C. Aebersold. Texas Repts. Biol. Med. 10, 143-59 (1952) Spring.

Availability and recent uses of isotopes and isotope-labeled materials for cancer research are reviewed. 26 references.

3949

CERTAIN ASPECTS OF THE MEDICAL APPLICATION OF ISOTOPIC TRACERS; CRITICAL REVIEW. G. Popjak. Quart. J. Med. 21, 83-122(1952) Jan.

Medical uses of radioisotopes for therapy and for tracer studies are reviewed 180 references.

3950

THE EFFECT OF CORTISONE AND CORTICOTROPIN ON THE BIOLOGIC DECAY OF THYROIDAL RADIOIODINE. A. Albert, Alida Tenney, and Elizabeth Ford. Endocrinology 50, 324-6(1952) Mar.

Fifty male rats maintained on an iodine-deficient diet for 2 weeks were used in two experiments. In the first experiment 25 rats were divided into 3 groups: a control group, a group receiving 2 I.U. corticotropin/day for 5 days, and a group receiving 2 mg cortisone/day for 5 days. On the sixth day 2 μc of carrier-free I^{131} were injected subcutaneously into all rats, and measurements over the thyroid were made at 2, 4, 6, and 24 hr, and daily for 14 days. In the second experiment all 25 rats were injected with 2 μc I^{131}, and a count for each animal was made 48 hr later. The experiment then continued as before. It was found that corticotropin and cortisone, while lowering the 24-hr accumulation of I^{131}, did not affect the discharge of thyroidal I^{131}.

3951

LACTATE AND CITRATE BIOSYNTHESIS. S. F. Carson. p.276-82 of Phosphorus Metabolism, Vol. I, William D. McElroy and Bentley Glass, eds. Baltimore, The Johns Hopkins Press, 1951.

Data on effect of pH on lactate formation and CO_2 fixation by Escherichia coli from C_1 and C_2 moieties indicate that at pH 7.4 only the methyl group of lactate comes from the methyl group of acetate; the methylene carbons of succinate arise from the methyl carbon of acetate, and there is no equilibration between the C_4 acids and lactate. At pH 5.3 the methyl carbon of acetate donates predominantly to the methyl group of lactate, and CO_2 is fixed in the carboxyl of lactate only. The small amount of C^{14} in the lactate carboxyl may arise via CO_2 fixation, since some acetate may be entirely converted to CO_2. HCOOH donates to the lactate carboxyl only, and therefore during the conversion of acetate (methyl) to lactate (methyl) it is highly unlikely that formate is an intermediate. The $C_2 + C_1$ condensation may provide a mechanism for the utilization of C_2 derived

from the aldolase (?) split of pentoses. The utilization of this C_2 fragment to form a C_3 compound is of general interest in that it suggests a pathway for the interconversion of pentoses and hexoses. Data on biosynthesis of citrate by Aspergillis niger indicate the existence of reactions leading to the formation of doubly-labeled acetate (acetate-1,2-C^{14}), and of extensive C_4- or C_5-acid synthesis during biosynthesis. It appears possible that citric acid itself is involved in one or more cyclic processes, although it is the end-product of carbon metabolism in this organism.

3952

THE EFFECT OF FASTING UPON LIPOGENESIS IN THE INTACT RAT. J. T. Van Bruggen, T. T. Hutchens, C. K. Claycomb, W. J. Cathey, and Edward S. West. J. Biol. Chem. 196, 389-94(1952) May.

C^{14}-carboxyl-labeled acetate was given intraperitoneally to fasted adult male rats, and the animals were allowed to metabolize the dose for 1 hr. Those fasted 120 hr lost about 25% body weight and about 75% of their fatty acids. The cholesterol content, however, remained essentially constant. The amount of C^{14} appearing in respired CO_2 did not change materially as the fast progressed from 1 to 120 hr. C^{14} appearing in fatty acids and cholesterol decreased to about one-third in this period. (auth)

3953

STUDIES ON THE RADIOACTIVE PENICILLIN. I. RADIOACTIVITY IN THE SOLUTION. Shunji Ishiyama and Kichizō Nagai. J. Antibotics (Japan) 5, 1-5(1952) Jan. (In Japanese)

Observations on radioactive penicillin, which was biosynthetically obtained and contained S^{35}, are described. The penicillin concentration was assayed by the cup method and one-dimentional diffusion method, and the radioactivity was counted with a Lauritzen's electrometer. (1) Comparative studies on the radioactivities of dry samples and those of solutions in different concentrations of the same samples illustrated the active absorption of the β-rays in water, broth, serum, blood, and other body fluids. (2) Successive changes of the radioactivities in the $C_n = A/n$ diffusion of penicillin were observed. (3) Successive changes of the radioactivities in the $C_n = C_0 \gamma^{(n-1)}$ diffusion of the penicillin were observed, where C_n is concentration of the penicillin in international units, and A, γ, n are parameters. (4) The radioactivities in time units in the penicillin diffusions were counted and followed up on semilogarithmic scales. The result suggests quantitative relations between the concentrations of the penicillin and the radioactivities in unit time. The following empirical formulas were deduced:

$$\log\left(\frac{dk}{dt}\right) = a \log C + \alpha \text{ or } \frac{dk}{dt} = AC^a,$$

where $\frac{dk}{dt}$ = radioactivity in unit time, C = concentration of penicillin, and a, A, and α are parameters. When the radioactivity is inversely proportional to double distances,

$$\log\left(\delta^2 \cdot \frac{dk}{dt}\right) = a \log C + \alpha,$$

and it expires according to $I = I_0 e^{-\lambda t}$, then

$$\log\left(e^{\lambda t} \cdot \delta^2 \cdot \frac{dk}{dt}\right) = a \log C + \alpha,$$

where δ = sample distance, e = base of the natural logarithm, d = half-life coefficient, and t = time. (auth)

3954

THE ROLE OF ONE-CARBON COMPOUNDS IN CITRIC ACID BIOSYNTHESIS. E. H. Mosbach, E. F. Phares, and S. F. Carson. Arch. Biochem. Biophys. 35, 435-42(1952) Feb.

The role of carbon dioxide, formic acid, and methanol in the formation of citric acid from sucrose by Aspergillus niger has been investigated. It was shown that labeled carbon dioxide enters the citric acid molecule via known reactions of CO_2-fixation and the tricarboxylic acid cycle; the label was found predominantly in the C-1 and C-6 positions. In addition, some labeling was discovered in the C-2 and C-5 carbons, possibly due to reversals in the cycle. Formic acid appeared to be oxidized to carbon dioxide before being incorporated into citric acid. Methanol was not utilized appreciably by A. niger for organic acid synthesis under the conditions of the experiment. (auth)

3955

LOSSES OF (RADIOACTIVE) SULPHUR AND PHOSPHORUS FROM RESTING BACTERIAL CELLS. T. C. N. Carroll, C. J. Danby, A. C. R. Dean, and Cyril Hinshelwood. J. Chem. Soc., 893-9(1952) Mar.

By the use of S^{35} and P^{32} it has been shown that there is a gradual loss of S and P from cells of Bact. lactis aerogenes which are suspended in a synthetic medium containing all growth requisites except a source of carbon. Such losses occur predominantly while the cells are still alive, and are slowed down abruptly if the cells are killed. Subsequent lysis is (at pH 7) a very much slower process. No simultaneous uptake of sulfate or phosphate from the medium has been detected under these conditions. The implications of these findings are considered; a lively exchange within the still living cell is suggested, whereby internal concentrations are maintained and feed the slow irreversible outflow. Techniques of S^{35} determination are discussed.

CHEMISTRY

3956

Radiation Lab., Univ. of Calif.

THE HEAT AND ENTROPY OF IONIZATION OF ANHYDROUS ACETIC ACID, by William L. Jolly. Apr. 1952. 11p. (UCRL-1688)

The heat of ionization of anhydrous acetic acid has been found to be $\Delta H^0 = 5700$ cal/mole. Combining this heat with the known ionization constant, one calculates an entropy of ionization, $\Delta S^0 = -38.6$ cal/deg mole. This entropy of ionization, like the corresponding value for liquid ammonia, is much more negative than the entropy of ionization of water. (auth)

3957

Technical Information Service, AEC

BARIUM; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE, by Simone B. Schwind, comp. June 9, 1952. (TID-369(pt. E))

This bibliography, which is arranged chronologically, consists of 4237 references covering the period 1903-1951. Indexes to authors, subjects, patent numbers, and report numbers are supplied, as is a list of abbreviations used for the periodicals to which references are made. Extensive coverage is given to the chemical, physical, metallurgical, and nuclear properties of barium and its compounds; ore treatment and biological studies have been omitted.

3958

Argonne National Lab.

AN X-RAY DIFFRACTION STUDY OF THE HAFNIUM-HYDROGEN SYSTEM, by S. S. Sidhu and J. C. McGuire. Apr. 29, 1952. 17p. (AECU-2042; ANL-FF-290e; UAC-563)

This report covers a study of the limit of solid solubility of H in Hf, the number of Hf-H phases formed, their crystalline structures, and the preparation of HfH_4.

3959

[Carnegie Inst. of Tech.]

PROGRESS REPORT FOR JANUARY 1952, by Alan Rothman, D. S. McKinney, and J. C. Warner. [nd] 5p. (NYO-549)

The solubility of zinc oxide as a function of acidity and basicity is reported for 30, 50, and 75°C. The free energy change for the decomposition of zinc carbonate from a study of the literature was thought to be about 4000 cal. The value obtained from the dissociation pressure at 24.3°C was found to be 3800 cal. The polarization potentials of Zr and Ti are reported as functions of time in sulfuric acid solution of different strength and for different anodic currents. The graph obtained for Ti was what was generally expected, while the graph for Zr had a plateau. The curve given for Zr is incomplete since potential values went above the highest readings on the potentiometer for the plateau.

3960

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF BORON MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. May 15, 1952. 10p. (NBS-1586)

The spectral data for BF are briefly discussed. Molecular constants reported recently by Chretien were used to calculate the ideal gas thermal properties of BF. Heat capacity, entropy, heat content and free energy functions are tabulated in dimensionless units at closely spaced temperature intervals. Chretien's value for $D_0(BF)$, 196 kcal/mole, is discussed. An alternate, lower value is suggested as a possibility. This was used to calculate the heat of formation of BF. (auth)

3961

THERMAL DATA, VAPOR PRESSURE AND ENTROPY OF BROMINE TRIFLUORIDE. George D. Oliver and J. W. Grisard. J. Am. Chem. Soc. 74, 2705-07(1952) June.

The heat capacity of bromine trifluoride was measured over the temperature range of 14 to 320°K. Three heat of fusion measurements gave an average value of 2874.6 ± 3 cal/mole at the triple point, 281.93°K. Vapor pressure measurements up to 1800 mm, which cover the temperature range 38 to 155° are represented by the equation $\log_{10} P_{mm} = 7.74853 - 1685.8/(t + 220.57)$. The calculated heat of vaporization at the boiling point, 125.75°, is 10.2 kcal/mole. The entropy of the liquid and ideal gas at 298.16°K are 42.57 ± 0.10 and 71.57 cal/deg mole, respectively. (auth)

3962

ALLYLIC CHLORIDES. XVII. PREPARATION AND PROPERTIES OF THE 1,3-DICHLORO-2-FLUOROPROPENES. Lewis F. Hatch and David W. McDonald. J. Am. Chem. Soc. 74, 2911-14(1952) June.

The two geometrical isomers of 1,3-dichloro-2-fluoropropene have been prepared and characterized. The assignment of configuration was made by a comparison of the relative reactivity of the two isomers toward potassium iodide in acetone. In addition to the 1,3-dichloro-2-fluoropropenes the following compounds were prepared and characterized: the 3-bromo-1-chloro-2-fluoro-1-propenes and the 3-chloro-2-fluoro-2-propen-1-ols. Configuration has also been assigned to the previously reported 1-chloro-2-fluoro-1-propenes and an average value of 0.95 for the atomic refraction of fluorine has been determined for compounds of this type.

3963

INTERCHANGE OF FISSION-PRODUCT BROMINE WITH CARRIER BROMINE. Andrew F. Stehney and Nathan Sugarman. J. Chem. Phys. 20, 629-31(1952) Apr.

Experiments on the interchange of the fission products 2.4-hr Br^{83} and 55.6-sec Br^{87} with carrier bromine have been performed. Essentially the same degree of interchange is effected by the following chemical procedures: carrier added as BrO_3^- and reduced by H_2S, carrier added as BrO_3^- and reduced by excess carrier Br^-, and carrier added as Br^- to HCl and irradiated uranium metal dissolved. (auth)

3964

ISOTOPE EFFECTS: REACTION AT THE CARBONYL GROUP. F. Brown and D. Alma Holland. Can. J. Chem. 30, 438-42(1952) May.

It is shown that benzophenone containing the $C^{14}O$ group reacts with 2,4-dinitrophenylhydrazine more slowly than does ordinary benzophenone. The ratio of the rate constants is 1.099 ± 0.011 at 27.8°C. (auth)

ANALYTICAL PROCEDURES

3965

Atomic Energy Project, Univ. of Calif., Los Angeles

GLUCOSE OXIDASE IN THE DETERMINATION OF GLUCOSE IN BIOLOGICAL MATERIALS, by William S. Beck. May 22, 1952. 8p. (UCLA-201)

A glucose oxidase, isolated from Aspergillus niger media, can be used with accuracy and high specificity in the determination of glucose. Data are presented which show advantages of the method in the measurement of glucose utilization by tissue, activity of glucose-liberating hydrolytic enzymes, and the determination of blood glucose, in comparison with the usual non-specific glucose methods. (auth)

3966

EXPERIMENTAL DETERMINATION OF THE ABSORPTION COEFFICIENTS OF α RAYS IN A SUBSTANCE OF UNKNOWN CHEMICAL COMPOSITION AND INVESTIGATION OF THE URANIUM AND THORIUM CONTENTS OF A RADIOACTIVE SUBSTANCE BY AUTORADIOGRAPHY. René Coppens and Goulven Vernois. Compt. rend. 234, 1974-6(1952) May 12. (In French)

Determination of U or Th contents is possible by comparing the absorption coefficient of the unknown with a sample of known composition. The results obtained by this method are verified by autoradiographic analysis of several U minerals.

3967

MEASUREMENT OF THE RADIOACTIVITY OF ROCKS WITH PHOTOGRAPHIC EMULSION. R. Coppens. Bull. soc. franç. minéral. et cristal. 75, 57-8(1952) Jan.-Mar. (In French)

Improvements in nuclear-emulsion techniques and a better value of the α emission rate of Th have resulted in corrections in several formulas relating α emission to U and Th content (Coppens, Bull. soc. franç. minéral. 73, 230(1950) Apr.-June). The three equations on p.230 of this latter paper should be $N_U = 9.208 C_U K'$, $N_{Th} = 2.64 C_{Th} K'$, and $N = (9.208 C_U + 2.64 C_{Th}) K'$, where N = α particles/cm²/sec, C is concentration, and K′ is an absorption coefficient.

3968

DETERMINATION OF SOIL MOISTURE BY NEUTRON SCATTERING. Wilford Gardner and Don Kirkham. Soil Sci. 73, 391-401(1952) May.

It has been shown theoretically, and experimentally for five soils, that a method involving the scattering and slowing of fast neutrons by hydrogen may be used for measuring soil moisture. The method rests primarily on two considerations: first, hydrogen is, practically, the only material that will slow fast neutrons; second, hydrogen in soils is present almost entirely in the form of water. A fast-neutron source and a slow-neutron counter (source and counter combined into a single unit) are lowered into a small auger hole in the soil. The counting rate of neutrons which have been slowed by soil hydrogen is a measure of the moisture content. The method should be adaptable to organic soils if the hydrogen content in the organic matter when dry is constant. The possibility of constructing portable equipment for measuring the amount of water in a certain depth of the surface soil is suggested. With the envisioned equipment it would not be necessary to disturb the soil in any way. The moisture de-

tection unit could be held at, or just above, the surface of the soil. (auth)

3969

AN IMPROVED CARBON-14 WET COMBUSTION TECHNIQUE. John H. Weisburger, Elizabeth K. Weisburger, and Harold P. Morris. J. Am. Chem. Soc. 74, 2399-400(1952) May 5.

A wet combustion technique for analysis of C^{14}-labeled substances is described in which the CO_2 was absorbed in NaOH and $BaCO_3$ was precipitated by adding $BaCl_2$ to the solution. A glass wool plug was inserted in the side arm between the combustion tube and absorber to prevent diffusion of SO_3 mist.

3970

METHOD OF MICRO DETECTION AND DETERMINATION OF COPPER IN SOLIDS AND AT DIFFERENT STEPS IN THE PREPARATION OF LUMINESCENT SUBSTANCES. Edmond Grillot. Compt. rend. 234, 1775-7(1952) Apr. 28. (In French)

After 64 hr of irradiation in the Châtillon pile, all solids contain a quantity of Cu^{64} proportional to the Cu content. The limit of detection by this activation analysis is 10^{-9} g of Cu. This technique furnishes a means, previously lacking, of determining Cu in luminescent solids at each step in their preparation.

3971

A RADIOCHEMICAL METHOD FOR THE DETERMINATION OF MICRO QUANTITIES OF THYROXINE. Frank C. Larson, Dale M. Coulson, and Edwin C. Albright. J. Biol. Chem. 196, 45-50(1952) May.

A quantitative determination of thyroxine is possible by measurement of exchanged I^{131} activity. The method is sensitive to quantities as small as 0.1 μg. Careful control of temperature, pH, I^0 catalysis, and reaction time is necessary.

ATOMIC WEIGHTS AND PERIODIC SYSTEMS

3972

REPORT OF THE COMMITTEE ON ATOMIC WEIGHTS OF THE AMERICAN CHEMICAL SOCIETY. Edward Wichers. J. Am. Chem. Soc. 74, 2447-50(1952) May 20.

The Commission on Atomic Weights of the International Union of Pure and Applied Chemistry, at its meeting in New York in Sept., 1951, adopted changes in the atomic weights of seven elements. The new values (chemical) are: Al, 26.98; Si, 28.09; P, 30.975; K, 39.100; Sc, 44.96; Kr, 83.80; I, 126.91. The atomic weights of C, N, Na, Mn, Tb, Tm, Au, and Ir, although not changed, are believed to be in error; probable best values are discussed.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3973

CRYSTAL STRUCTURE OF ANHYDROUS SODIUM HEXAFLUOROPHOSPHATE. Hans Bode and Günther Teufer. Z. anorg. u. allgem. Chem. 268, 20-4(1952) Apr. (In German)

$NaPF_6.H_2O$ can be dehydrated easily over concentrated H_2SO_4. The anhydrous crystalline $NaPF_6$ is cubic with a lattice constant of 7.61 A and four molecules to the unit cell. A structure is proposed based on that of KPF_6.

3974

A SINGLE CRYSTAL NEUTRON DIFFRACTION DETERMINATION OF THE HYDROGEN POSITION IN POTASSIUM BIFLUORIDE. S. W. Peterson and Henri A. Levy. J. Chem. Phys. 20, 704-7(1952) Apr.

Neutron diffraction measurements on KHF_2 single crystals show that the hydrogen atom occupies the central position, within 0.1A, in the linear F–H–F ion. The data also indicate asymmetry in thermal motion, which suggests that the bifluoride ion undergoes rotatory oscillation with appreciable amplitude. The study demonstrates the usefulness of single crystal neutron diffraction data for crystal structure determination. (auth)

3975

THE CRYSTAL STRUCTURE OF Ti_3Au AND Ti_3Pt. Pol Duwez and Charles B. Jordan. Acta. Cryst. 5, 213-14 (1952) Mar.

Powder patterns indicate that Ti_3Au and Ti_3Pt crystallize in the A 15 (β-wolfram) structure with lattice parameters of 5·096 and 5·033 A, respectively. (auth)

3976

THE STRUCTURE OF THE σ PHASE IN VANADIUM–NICKEL ALLOYS. W. B. Pearson and J. W. Christian. Acta Cryst. 5, 157-62(1952) Mar.

The σ phase in the system vanadium–nickel has been investigated by single-crystal and powder-photograph methods. The unit cell is tetragonal with a = 8·966 and c = 4·641 A for an alloy containing 60 atomic % vanadium. Structure factors obtained from Cu oscillation photographs and Cu and Cr powder photographs are compared with those calculated from the atomic positions given by Tucker for β-uranium and Kasper, Decker & Belanger for the cobalt–chromium σ phase. The Cr oscillation photographs suggest there may be a tendency toward ordering of the atomic positions in which the layers are occupied alternately by one kind of atom or the other. Powder photographs have been used to obtain accurate d values for the principal σ phase lines of the σ phases formed in the first long period and, except for slight variations in axial ratio, these phases appear to be completely isomorphous. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

3977

SOME MEASUREMENTS OF THE SELF-DIFFUSION COEFFICIENTS OF LIQUIDS. K. Graupner and E. R. S. Winter. J. Chem. Soc., 1145-50(1952) Mar.

By use of deuterium as tracer element, the self-diffusion coefficients of water, benzene, bromoethane, and ethanol have been measured over the temperature range 15 to 45°. For water, some measurements have also been made by using O^{18}. (auth)

3978

THE HEAVY HYDROGEN ATOM AND THE SOLAR SPECTRUM. Junior Gauzit. Compt. rend. 234, 1951-3(1952) May 12. (In French)

Comparison of the solar spectrum with that of D indicates that the D/H ratio in the sun's atmosphere is not greater than the ratio on earth.

3979

MASS SPECTRA OF DEUTEROACETYLENES, MONODEUTEROBENZENE, AND DEUTERONAPHTHALENES. Fred L. Mohler, Vernon H. Dibeler, Laura Williamson, and Helen Dean. J. Research Natl. Bur. Standards. 48, 188-92 (1952) Mar.

Mass spectra at 70-volt ionizing voltage have been measured for C_2H_2, C_2HD, C_2D_2, C_6H_6, C_6H_5D, $C_{10}H_8$, $C_{10}H_7D$, and for a mixture of $C_{10}D_8$ and $C_{10}HD_7$. In acetylene, benzene, and naphthalene it is possible to measure the isotopic purity at ionizing voltages below the appearance potential of any fragment ions and to correct the observed spectra of monodeutero compounds for isotopic impurity. For C_2HD the probability of removing the H atom is nearly twice as great as that of removing the D atom. In monodeutero benzene and naphthalene, on the other hand, there is no such selectivity, and it is possible to compute the spectra of the monodeutero compounds on the basis of equal a priori probability of removing a single H or D atom. By assuming that equal probability holds for doubly charged ions, the complete doubly

charged ion spectra can be computed from the observed half-integer peaks. Similarly, the spectra of $C_{16}D_8$ and $C_{16}HD_7$ are computed from a spectrum of a mixture of the two compounds. (auth)

3980

DIELECTRIC PROPERTIES OF SEVERAL HALOGENIDES OF HYDROGEN AND DEUTERIUM IN THE SOLID STATE. C. S. E. Phillips. J. phys. radium 13, 216-23(1952) Apr. (In French)

The dielectric constants, electric hysteresis, and loss constants of solid HCl, DCl, HI, and DI have been measured as functions of temperature from 63°K to the melting point and of frequency from 80 cps to 6 Mc. Variations with the transition points and hysteresis domains are discussed. 9 figures.

3981

HYDROGEN-DEUTERIUM EXCHANGE IN AQUEOUS SOLUTIONS OF GLYCOLLIC ACID AND OF SODIUM FORMATE. L. D. C. Bok and L. B. Petters. J. Chem. Soc., 1524-5 (1952) Apr.

By carrying out a number of exchange experiments with aqueous solutions of glycolic acid at 210, 200, and 190°C, 330 hr has been obtained as the approximate time of half-change for the forward (protium-rich substance + deuterium-rich solvent) exchange of the α-carbon hydrogen and 470 hr for the reverse reaction at 160°C. An approximate activation energy calculated for the hydrogen exchange in glycolic acid is 30 kcal. Na formate partly converted into formic acid by addition of DCl exchanged the α-carbon hydrogen at about the same rate (800 hr) as the formate ion. The exchange was more rapid when excess of DCl was present. The influence of atoms or radicals attached to the α-carbon is discussed.

3982

INFRARED SPECTRA OF AMINO ACIDS IN HEAVY WATER SOLUTION. Henri Lenormant. Compt. rend. 234, 1959-61 (1952) May 12. (In French)

Contrary to the case in H_2O, good transparence to infrared rays is exhibited by D_2O between 4 and 8 μ. The α-amino acids have similar and relatively simple spectra in this region. Spectra of β-alanine and d(−)alanine at various pH's are traced.

FLUORINE AND FLUORINE COMPOUNDS

3983

National Bureau of Standards

THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT, AND FREE ENERGY FUNCTIONS OF BORON TRIFLUORIDE IN THE IDEAL GASEOUS STATE, by Rita M. Potocki and David Emerson Mann. May 15, 1952. 7p. (NBS-1561)

Values for the heat capacity, enthalpy, free energy, and entropy of boron trifluoride in the ideal gas state are tabulated in dimensionless units at close temperature intervals from 50 to 5000°K. Equilibrium constants for several reactions involving BF_3 and its decomposition products have been calculated for temperatures ranging from 300 to 5000°K. (auth)

3984

A NEW PROCESS FOR INTRODUCTION OF FLUORINE INTO ORGANIC COMPOUNDS. Friedrich Nerdel. Naturwissenschaften 39, 209-10(1952) May. (In German)

HgF_2, which is readily prepared by reaction of metallic Hg with ClF_3, is a practical fluorinating agent, adding F to either bond- or valence-unsaturated substances. The Hg appears as the metal. Reaction of HgF_2 with acetonitrile gives CH_3CFNF, $CH_3CF_2NF_2$, CH_2CNF, and CH_2CFNF_2. Quantitative yields of fluorophosgene are produced by reaction with CO. Addition to ethylene results in a complex mixture of fluorides, and two or four F atoms are added to the S in dimethylsulfide.

3985

FLUORINATION OF THIOPHENE. Jean Neudorffer. Compt. rend. 234, 1983-4(1952) May 12. (In French)

Fractional distillation of the liquid resulting from the action of F_2 on thiophene showed the presence of a saturated fluorocarbon (m.p., −93°C; b.p., +18°C; d_4^0, 1.72; M.W., 232 at +30°C, 212 at 90°C) of empirical formula $(CF_2)_4$ and probably cyclic. Another fluorocarbon, apparently of formula $(CF_2)_8$ was observed but not isolated. The mechanism of F_2 attack on thiophene is discussed.

3986

THE MICROWAVE SPECTRA AND MOLECULAR STRUCTURES OF TRIFLUOROMETHYL BROMIDE, IODIDE, AND CYANIDE. John Sheridan and Walter Gordy. J. Chem. Phys. 20, 591-5(1952) Apr.

The pure rotational spectra of trifluoromethyl bromide, iodide, and cyanide have been studied in the microwave region. The B_0 values in Mc were determined as follows: 2098.06 for CF_3Br^{79}; 2078.50 for CF_3Br^{81}; 1523.23 for CF_3I; 2945.535 for CF_3CN^{14}; 2855.859 for CF_3CN^{15}. The nuclear quadrupole couplings, eQq, are in Mc: 619 for Br^{79}; 517 for Br^{81}; −2150 for I^{127}; −470 for N^{14}. With any reasonable assumption of bond angles, d_{CF} is found to be 1.33 ± 0.015A in each molecule. The other distances depend more strongly on the assumption of the bond angles. With ∠FCF assumed to be 108° ± 1°, as suggested from other similar molecules, the values, d_{CBr} = 1.91 ± 0.02A, d_{CI} = 2.14 ± 0.02A, d_{CC} = 1.46 ± 0.02A, are obtained, where the additional assumptions d_{CF} = 1.332A for CF_3I and d_{CN} = 1.158A for CF_3CN are made. (auth)

3987

THERMODYNAMIC PROPERTIES OF THE FLUORINE ATOM AND MOLECULE AND OF HYDROGEN FLUORIDE TO 5000°K. Leland G. Cole, M. Farber, and G. W. Elverum, Jr. J. Chem. Phys. 20, 586-90(1952) Apr.

The evaluation of the thermodynamic functions C_p^0, S^0, $-(F^0-E_0^0)/T$, and $(H^0-E_0^0)/T$ of the fluorine atom and molecule and of hydrogen fluoride from 100°K to 5000°K have been made by statistical calculations from available spectral constants for the atom and for hydrogen fluoride; for fluorine the constants have been derived or estimated from the Raman shift in gaseous fluorine, the equilibrium internuclear distance from electron diffraction measurements, and the heat of dissociation obtained recently by R. N. Doescher at this laboratory. These results have been combined with the thermodynamic functions of hydrogen to evaluate the heats and free energies of dissociation and dissociation constants for the equilibria $F_2 \rightleftharpoons 2F$, $HF \rightleftharpoons \frac{1}{2}H_2 + \frac{1}{2}F_2$, and $HF \rightleftharpoons H + F$. (auth)

3988

THE SPREADING OF LIQUIDS ON LOW-ENERGY SURFACES. II. MODIFIED TETRAFLUOROETHYLENE POLYMERS. H. W. Fox and W. A. Zisman. J. Colloid Sci. 7, 109-21(1952) Apr.

Data are presented on the equilibrium contact angles of a wide variety of liquids on specially prepared surfaces of halogenated derivatives of polyethylene. The free energy decrease of immersion (f_{SL}), the work on adhesion (W_A), and the spreading coefficients have been calculated for the liquids which do not spread. The free energy decrease on immersion of these solids in the saturated vapor of most of the liquids of this study is shown to be negligible. For each solid surface the contact angle and spreading coefficient follow the relation to liquid surface tension reported previously for polytetrafluoroethylene, i.e., as the liquid surface tension increases, the contact angle increases and the spreading coefficient decreases. Substitution of chlorine or

hydrogen for fluorine in these polymers increases W_A, f_{SL}, and the spreading coefficient with respect to a given liquid, the increase depending on the proportion of nonfluorine substituent. Substitution of hydrogen for fluorine has a smaller effect in this respect than substitution of chlorine for fluorine. It is shown that when f_{SL} for a given solid in a series of liquids is constant, the plots of W_A vs. surface tension and spreading coefficient vs. surface tension should be straight lines with positive and negative 45° slopes, respectively. The data presented for the fluorinated polymers and the liquid n-alkanes and di-n-alkyl ethers fall on such lines. The values of f_{SL} for the fluorinated polymers plot as a straight line against mole per cent fluorine substitution. There appears to be a maximum value of W_A characteristic of the polymer, which is identical with the work of adhesion given by the liquid having a contact angle of 90° on the given solid. It is shown experimentally that there are many exceptions to the "rule" that nonpolar liquids wet nonpolar solids. From the data it is shown that recent attempts to measure the surface tension of solids by contact angle measurements alone involve unjustifiable assumptions. (auth)

3989

ISOTHERMS AND THERMODYNAMIC FUNCTIONS OF METHYL FLUORIDE AT TEMPERATURES BETWEEN 0°C AND 150°C AND AT PRESSURES UP TO 150 ATMOSPHERES. A. Michels, A. Visser, R. J. Lunbeck, and G. J. Wolkers. Physica 8, 114-20(1952) Feb.

The compressibility isotherms and thermodynamic functions of methyl fluoride are given for temperatures between 0° and 150°C and for pressures up to 150 atmospheres. Methyl fluoride was prepared by heating KCH_3SO_4 with NaF and then purified. Two series of measurements were carried out with normal volumes of 1158.02 and 63.8 cm^3. The results are tabulated.

3990

STORAGE OF RADIATION ENERGY IN CRYSTALLINE LITHIUM FLUORIDE AND METAMICT MINERALS. Frederick F. Morehead, Jr., and Farrington Daniels. J. Phys. Chem. 56, 546-8(1952) May

Measurements have been made on the energy of thermoluminescence obtained when LiF is exposed to 30,000 r of γ radiation and then heated to 500°C. The bluish light emitted is equivalent to 1.5×10^{-6} cal/g and amounts to a storage in electron traps of about 0.005% of the γ radiation. Metamict minerals have their crystal lattices so damaged by alpha rays from radioactive elements for millions of years that they fail to exhibit an x-ray-diffraction pattern. When the temperature is raised to 450°C, however, the crystal lattice is restored and at the same time, it has been found in this investigation that there is an evolution of about 25 cal/g, as measured with a thermal analysis apparatus. (auth)

3991

INFRARED AND RAMAN SPECTRA OF FLUORINATED ETHANES. IV. THE SERIES CH_3-CH_3, CH_3-CH_2F, CH_3-CHF_2, AND CH_3-CF_3. D. C. Smith, R. A. Saunders, J. Rud Nielson, and E. E. Ferguson. J. Chem. Phys. 20, 847-59(1952) May.

The infrared spectra of ethyl fluoride and 1,1-difluoroethane vapors have been obtained in the region from 2 to 38μ, and the spectra of the liquids from 2 to 22μ, with the aid of LiF, NaCl, KBr, and KRS-5 prisms. The Raman spectra of both compounds were studied in the liquid phase with a three-prism glass spectrograph of linear dispersion 15A/mm at 4358A. Depolarization ratios were determined for the stronger bands. The Raman spectrum of 1,1-difluoroethane was also obtained for the gaseous phase. A complete assignment of fundamental frequencies is proposed for each molecule and used in a detailed interpretation of the spectra and for the calculation of thermodynamic functions over the temperature range 298 to 600°K and at the boiling point. (auth)

3992

NOTE ON THE DECOMPOSITION OF ALKALINE HALIDES UNDER THE ACTION OF SODIUM METAPHOSPHATE. Remziye Salih Hisar. Bull. soc. chim. France, 308(1952) Mar.-Apr. (In French)

Heating an intimate equimolar mixture of Na metaphosphate and an alkali halide in air results in evolution of elemental halogen by the reaction $2NaX + Na_2P_2O_6 + \frac{1}{2}O_2 \rightarrow Na_4P_2O_7 + X_2$. The velocity of the reaction depends on the temperature and halide (NaF, NaCl, NaBr, KI) employed. Between 300 and 350°C the halide acts catalytically in polymerizing the metaphosphate. The reaction with NaF is proposed, under proper conditions, as a method of preparing F_2 chemically.

3993

ON THE QUESTION OF FLUORINE PRODUCTION BY CHEMICAL MEANS. O. Schmitz-Dumont and Paul Opgenhoff. Z. anorg. u. allgem. Chem. 268, 57-68(1952) Apr. (In German)

Several proposed methods for chemical production of F_2 were tested. Thermal decomposition of $KCrO_3F$ in the absence of water follows the equation $12KCrO_3F \rightarrow 2K_3CrF_6 + Cr_2O_3 + 4K_2Cr_2O_7 + 2\frac{1}{2}O_2$ with no formation of F_2. The exchange of F with O in $K_3MoO_3F_3$ and K_2TiOF_4 proceeds only in the presence of moisture, so that hydrolytic processes result in HF rather than F_2 appearing; i.e., $K_3MoO_3F_3 + H_2O \rightarrow K_3MoO_4F + 2HF$, and $K_2TiF_6 + H_2O \rightarrow K_2TiOF_4 + 2HF$. It is concluded that chemical production of F_2 is impossible.

3994

THE REACTIONS OF HIGHLY FLUORINATED ORGANIC COMPOUNDS. PART I. THE PREPARATION AND REACTIONS OF SOME CHLOROUNDECAFLUOROCYCLOHEXANES. J. C. Tatlow and R. E. Worthington. J. Chem. Soc., 1251-7(1952) Apr.

The fluorination of o-dichlorobenzene in the vapor phase with cobaltic fluoride gave mainly chloroundecafluorocyclohexane and 1,2-dichlorodecafluorocyclohexane. The former was obtained also by a similar fluorination of chlorobenzene. Chloroundecafluorocyclohexane, when treated with $LiAlH_4$, gave the corresponding fluorohydrocarbon, undecafluorocyclohexane, by exchange of H for Cl. This reacted with aqueous alkali, being converted by loss of HF into perfluorocyclohexene. From this olefin the dibromo and dichloro addition products were prepared, and oxidation afforded perfluoroadipic acid which was converted into certain derivatives. (auth)

GRAPHITE

3995

Knolls Atomic Power Lab.

THEORY OF THE LOW TEMPERATURE SPECIFIC HEAT OF GRAPHITE, by J. A. Krumhansl. Knolls Atomic Power Lab. and Cornell Univ. Apr. 25, 1952. 35p. (KAPL-730)

The theory of the specific heat of graphite is presented. Graphite is highly anisotropic in its elastic behavior. It is concluded that the anomalous specific heat variation with temperature (T^2 instead of T^3 for ordinary solids at low temperature) is due to this anisotropy. It is, therefore, probably an intrinsic property of the crystal and is not due to particle size effect. In connection with the general problem some references on the specific heat of graphite which are of interest are listed.

3996

THE REDUCTION OF THE CRYSTALLINE PERFECTION OF GRAPHITE BY GRINDING. G. E. Bacon. Acta Cryst. 5, 392(1952) May.

The variation with time of grinding of the over-all height of the parallel stacks of layers (both oriented and disoriented), of the diameter of the layer planes, and of the probability of layer displacement with continued grinding of electric-furnace graphite are shown. A sample of natural Ceylon graphite was degenerated to the condition of a normal electric-furnace graphite by continued grinding.

3997
AMORPHOUS CARBON. Thomas D. Smith. J. Chem. Soc., 923-7(1952) Mar.

Carbons, prepared by carbonization of organic compounds, have been examined by x-ray diffraction and gas adsorption. The presence of O in the organic molecule profoundly affects the crystallographic character of the resultant chars. Surface areas of these chars vary appreciably: very large areas may be due to the presence of a highly porous three-dimensional cross-linked structure; small areas occur when the material decomposes in the fused state. (auth)

LABORATORIES AND EQUIPMENT

3998
THE "HOT" LABORATORY AT THE UNIVERSITY OF BIRMINGHAM. A. J. Swallow. Atomic Scientists News 1, 130-5(1952) Mar.

A hot laboratory for handling the radioactive targets (up to 100 mc) from a 60" cyclotron is described. A floor plan of the laboratory is given.

MOLECULAR STRUCTURE

3999
A QUANTUM-MECHANICAL TREATMENT OF THE F_2 BOND. F. Schlögl, Z. Physik 131, 505-27(1952). (In German)

The F_2 molecule is treated by a perturbation method using, instead of a wave equation of the electrons, a wave equation of the vacancies in the atomic shells. By this method only the differences between 12 excitation terms of the molecules are given, not the terms themselves, which can then be obtained by acceptance of Morse's principle for the ground term.

RADIATION CHEMISTRY

4000
Notre Dame Univ.
EXCITED MOLECULE THEORY OF RADIATION CHEMISTRY OF LIQUIDS, by Milton Burton, John L. Magee and Aryeh H. Samuel. [nd] 4p. (AECU-2045)

As a result of consideration of elementary physical processes produced by ionizing radiation in water we have concluded that the chemical effects start substantially from two classes of excited states, M^* and $M^\dagger$. The former is primarily produced, either in the primary ionization column or its "spurs," has comparatively small energy, and is relatively persistent; the excitation associated with M^* may diffuse as exciton or photon to a relatively remote position. The $M^\dagger$ is produced by ion neutralization and decomposes (if at all) relatively rapidly near its production site. A brief summary of the bases of these conclusions is given. (auth)

4001
Notre Dame Univ.
INFLUENCE OF RADIATION DECOMPOSITION ON RETENTION IN THE SZILARD-CHALMERS REACTION, by William H. Hamill and Russell R. Williams, Jr. Feb. 19, 1952. 10p. (AECU-2057)

Possible effects of simultaneous radiation dissociation of organic halides during neutron bombardment are discussed. A reaction mechanism whose consequences agree qualitatively with several experimental observations is proposed and the nature of proper experimental tests is discussed.

4002
Notre Dame Univ.
THE SZILARD-CHALMERS REACTION WITH INORGANIC COMPOUNDS OF IODINE, by Robert E. Cleary, William H. Hamill, and Russell R. Williams, Jr. Jan. 1952. 21p. (AECU-2058)

A discussion is presented on the quantitative determinations of the distribution of I^{128} activity between the various valence states of I after neutron bombardments of various solid inorganic compounds and solutions of pentavalent and heptavalent I.

4003
ATOMS AND RADICALS IN AQUEOUS MEDIA. F. S. Dainton. J. Chem. Soc., 1533-46(1952) Apr.

Certain topics on the formation of free radicals and atoms in H_2O by ionizing radiation and other means and the mechanism of the numerous oxidation-reduction reactions thus produced are discussed. 28 references.

RADIATION EFFECTS

4004
Illinois Univ.
BIMONTHLY PROGRESS REPORT NO. 2 AUGUST 15, 1951 TO OCTOBER 15, 1951; STUDIES OF EFFECTS OF HIGH ENERGY RADIATION ON CHEMICAL SYSTEMS, by C. L. Clark, J. Fuchs, P. E. Bierstedt, and J. O. Gardner. [nd] 10p. (NP-3799; U19875)

Several types of compounds and reactions were studied to determine a stable chemical system which would be satisfactory for accurate quantitative estimations of the amount of high-energy radiation to which the system had been exposed. No visible difference was noted in the color reaction of irradiated (50,000 r) and nonirradiated samples of bis (2,3,5-trifluorophenyl)-triazine,N-(2-nitro-3-trifluoromethyl)phenylurethane, 2,-5-diamino-4-trifluoromethylfluorobenzene, 2,5-difluoroquinone, 6 complex inorganic compounds containing Co, and solidified melts of benzoic acid or urea with methyl red. The color reaction described by Terenin and Karyakin (Doklady Akad. Nauk SSSR. 68, 345(1949)) was observed in solidified melts of thiourea with phenolphthalein or methyl red; however, irradiation failed to restore the faded color. Heating an aqueous solution of $Fe_2(SO_4)_3$ and potassium biphthalate following the addition of H_2O_2 (30%) produced a medium brown color in the irradiated solution and a light brown color in the untreated. Alizarin, alizarin S, benzoin oxime, and quinalizarin were added to irradiated (1000 r) solutions of cysteine; the reactions of Dale and Davies (Biochem. J. 48, 129(1951)) and Dent and Rose (Biochem. J. 44, 610(1949)) were not satisfactory in differentiating cysteine and cystine. The color change produced by cysteine and cystine on the colloidal silver surface on photographic paper seemed promising. (NRS abst.)

4005
THE ACTION OF IONIZING RADIATIONS AND OF RADIOMETRIC SUBSTANCES ON DEOXYRIBONUCLEIC ACID. PART V. SOME EXPERIMENTS ON THE ACTION OF X-RAYS AND FREE RADICALS. B. E. Conway and J. A. V. Butler. J. Chem. Soc., 834-8(1952) Mar.

Experiments have been made to determine the nature of the agent which causes the slow continued change of viscosity of thymus desoxyribonucleic acid after irradiation with x rays in oxygen-containing solutions. Although the change resembles that brought about by H_2O_2 when suitably activated, the actual amount of H_2O_2 formed is too small to account for the phenomenon. It is suggested that the initial agent is the radical HO_2. (auth)

4006

EFFECTS OF COBALT γ-RADIATION OF WATER AND AQUEOUS SOLUTIONS. C. J. Hochanadel. J. Phys. Chem. 56, 587-94(1952) May.

The radiation decomposition of water and the radiation-induced back reaction of the products H_2 and H_2O_2 have been studied using a cobalt gamma-ray source. Absolute yields were determined by comparison with an acid ferrous sulfate actinometer which had been calibrated calorimetrically. The measured yield for oxidation of Fe^{++} in air-saturated 0.4M H_2SO_4 was 15.5 ± 0.3 Fe^{++} oxidized per 100 ev absorbed. The decomposition of water by any ionizing radiation is treated as occurring in two separate reactions: $2H_2O \longrightarrow H_2O_2 + H_2$ and $H_2O \longrightarrow OH + H$. The value for $k_F = 0.46$ H_2O_2 and H_2 per 100 ev was determined from H_2O_2 in yield in oxygen-free acid bromide solutions. The value for $k_R = 2.74$ H and OH per 100 ev was determined from the H_2O_2 yield in solutions containing both H_2 and O_2. The minimum yield for decomposition of water by γ radiation is then 3.66 H_2O per 100 ev or 1 H_2O per 27 ev. The radiation-induced reaction between dissolved product molecules H_2 and H_2O_2 was studied under a variety of conditions. The kinetics are discussed in terms of reactions with free radicals, H, OH and HO_2. (auth)

4007

STRUCTURAL CHANGES IN CRYSTALS BY BOMBARDMENT WITH α PARTICLES. Berthold Stech. Z. Naturforsch. 7a, 175-85(1952) Feb. (In German)

Graphite, carbon black, metallic Se, and crystalline ZnS, HgS, CaF_2, NaF_2, KCl, Na_2CO_3, $KMnO_4$, As_2O_3, Na oxalate, anthracene, urotropine, tartaric acid, and urea were bombarded with Rn α particles in relatively large doses. Debye-Scherrer diagrams were then taken in order to study structural changes. No changes were found in crystals with strong bonds, high degree of space utilization, or high electron mobility, in so far as the molecule itself was stable. Disturbances of the type of frozen-in thermal vibrations, reduction of coherent crystal regions, or liquid-like structures up to macroscopically visible decomposition were found in nonconductors with weak bonds (molecular lattice), low space utilization, or limited chemical stability. The strong columnar ionization by the particle is necessary for these disturbances. A transition from the amorphous to the stable crystalline modification was observed for Se.

4008

THE ACTION OF γ-RADIATION ON AQUEOUS SOLUTIONS OF CYSTEINE. A. J. Swallow. J. Chem. Soc., 1334-9 (1952) Apr.

It is shown that dilute aqueous solutions of cysteine hydrochloride are oxidized by the action of γ radiation and that for air-saturated solutions the ionic yield increases with concentration. For a 0·051M solution of cysteine hydrochloride the ionic yield is 24, which is too great to be explained without postulating a chain reaction. In the absence of dissolved oxygen the ionic yield for a 0·051M solution is 3. These results are explained by equations which may have implications for enzyme chemistry. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

4009

Technical Information Service, AEC

LANTHANIDE SERIES RARE EARTHS; AN ANNOTATED LIST OF UNCLASSIFIED REFERENCES, by Robert L. Morgan, comp. May 29, 1952. (TID-3029)

This list of annotated references was prepared from reports in the Technical Information Service files to provide the public with a selected survey of the AEC unclassified research and development information available concerning Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Tm, Yb, and Lu. In the selection, emphasis has been placed on reports containing data on the properties of the elements and methods for preparing the metals. (auth)

4010

Ames Lab.

CONDUCTANCES, TRANSFERENCE NUMBERS, AND ACTIVITY COEFFICIENTS OF AQUEOUS SOLUTIONS OF SOME RARE EARTH HALIDES AT 25°C, by F. H. Spedding and I. S. Yaffe. May 22, 1952. 20p. (ISC-232)

The equivalent conductances, cation transference numbers and activity coefficients at 25°C of aqueous solutions of $LaBr_3$, $PrBr_3$, $NdBr_3$, $GdBr_3$, $HoBr_3$, $ErBr_3$ and $GdCl_3$ have been determined for concentrations up to 0.1 normal. Also the equivalent conductances of $NdCl_3$ have been redetermined. The Onsager law for conductance is obeyed for all halides studied up to a concentration of approximately 0.001N. The transference numbers, determined by the moving boundary method, were found to be linear functions of the square root of the concentration; the slopes of these functions differed by a factor of approximately one-fifth from those predicted by the Onsager law. The activity coefficients, determined by the use of concentration cells with transference, were found to agree with those predicted by the Debye-Hückel law providing that the experimentally determined å values were used to calculate the theoretical coefficients. All data reported are correlated with data on the rare-earth chlorides previously reported. (auth)

4011

HYDRATION OF SEVERAL RARE-EARTH OXIDES AND ITS EFFECT ON CORROSION IN AIR OF THE CORRESPONDING METALS. Suzanne Barbezat and Jean Loriers. Compt. rend. 234, 1978-80(1952) May 12. (In French)

La_2O_3, Ce_2O_3, and Pr_2O_3 were found to react with water to give hydroxides of the type $M(OH)_3$ with an important volume increase. Oxides of the IV valence state did not react appreciably with water. The significance of these results on the mechanism of oxidation of the metals in humid air is discussed.

4012

CERIUM(III) SULFIDE AND SELENIDE AND SOME OF THEIR SOLID SOLUTIONS. E. Banks, K. F. Stripp, H. W. Newkirk, and R. Ward. J. Am. Chem. Soc. 74, 2450-3 (1952) May 20.

The relationship between the complex and cubic phases of Ce(III) sulfide has been investigated by the use of molten salts to extract the oxide from the complex form. It has been shown that the complex phase is not a mixture containing the cubic phase. Some solid solution of flux constituents in the Ce_2S_3 crystals occurs. Ce(III) selenide, Ce_2Se_3, and oxyselenide, Ce_2O_2Se, have been prepared and shown to be isomorphous with the corresponding sulfides. Ce(II) selenide has been prepared by the Na reduction of Ce(III) selenide, and is isomorphous with CeS. Solid solutions of Sr sulfide and selenide in the corresponding Ce(III) compounds have been shown to exist up to complete filling of the defect structure of the Ce compounds (50 mole %) with an increase in lattice constant. In the case of the sulfides, Ca and Mg sulfides show lower solubility limits, with a contraction of the Ce_2S_3 lattice. (auth)

4013

EFFECT OF CRYSTALLINE FIELDS ON THE MAGNETIC PROPERTIES OF ANHYDROUS NEODYMIUM COBALTICYANIDE AND BERYLLIUM AND NEODYMIUM NICKELOCYANIDE HYDRATES. Nicolas Perakis and Triphon Karantassis. Compt. rend. 234, 1759-61(1952) Apr. 28. (In French)

The magnetic properties of Be $[Ni(CN)_4].2H_2O$, Nd $[Co(CN)_6]$, and $Nd_2[Ni(CN)_4]_3.7H_2O$ were measured between liquid-N_2 and room temperatures for the purpose of investigating the effect of the strong crystalline field on the magnetic moments. The behavior of Ni and Co indicates an exceptional case of Van Vleck's theory of crystalline fields, but the free ion Nd^{+3} behaves as normally as in simple salts.

SEPARATION PROCEDURES

4014

Radiation Lab., Univ. of Calif.

ANION EXCHANGE OF NIOBIUM IN 7.0 MOLAR HYDROCHLORIC ACID, by E. H. Huffman and G. M. Iddings. Apr. 23, 1952. 4p. (UCRL-1777)

A recent report (Brown and Rieman, J. Am. Chem. Soc. 74, 1278(1952); NSA 6-2343) that elution of Ti from a cation-exchange resin with citrate solution resulted in broad elution bands with several peaks attributed this behavior to partial separation of Ti isotopes. The present single-nuclide study on the anion exchange of carrier-free Nb^{95} resulted in elution curves of similar behavior and also not exactly reproducible. This departure from the expected type of elution band can probably be attributed to the slow establishment of equilibrium among various ionic species that are present.

4015

Wisconsin Univ.

EXTRACTION OF ZIRCONIUM AND HAFNIUM WITH VARIOUS β DIKETONES; TECHNICAL REPORT IV, by Edwin M. Larsen and Glenn Terry. May 1, 1952. 6p. (NP-3830; U22135; Technical Report IV)

The equilibrium constants (K_{eq}) for the reaction of Zr and Hf in $HcLO_4$ with the β diketones 2-thenoyltrifluoroacetone (TTA), 2-furoyltrifluoroacetone (FTA), 2-pryrroyltrifluoroacetone (PTA), and trifluoroacetylacetone (CTA) in C_6H_6 were determined according to the method of Connick and Reas (J. Am. Chem. Soc. 73, 1171-6(1951)). The data showed a fourth-power dependence on diketone concentration; for PTA above 0.02M a third-power dependence was obtained. The ratios of K_{eqZr}/K_{eqHf} for TTA and FTA were about equal but larger than the ratios for PTA and CTA which also were about equal. The magnitude of K_{eq} values decreased in the order TTA > FTA > PTA > CTA. (NRS abst.)

4016

Radiation Lab., Univ. of Calif.

PAPER CHROMATOGRAPHY OF STEROIDS, by David Kritchevsky and Martha R. Kirk. May 15, 1952. 13p. (UCRL-1749)

The preparation and use of "Quilon" (stearato chromic chloride) impregnated paper for the reverse phase paper partition chromatography of steroids is described. The R_f values for a number of steroids in a variety of solvents are reported. Separation of cholesterol from epicholesterol, ergosterol and 7-dehydrocholesterol has been achieved. Several other separations are also reported. (auth)

4017

ISOLATION OF RADIOISOTOPES OF Zn, Ga, In, V, Mo, Pd, Os, Ir, AND Pt IN ALMOST CARRIER-FREE STATE BY THE (n,γ) RECOIL PROCESS FROM PHTHALOCYANINE METAL COMPLEXES. Wilfrid Herr. Z. Naturforsch. 7b, 201-7(1952) Apr. (In German)

Phthalocyanine complexes were found to give good yields by the Szilard-Chalmers reaction. Enrichment of the radioactive atoms by $>10^3$ was not difficult. Yields of recoil atoms were ~90% for the light and medium elements, but only ~12% for Pt and Ir phthalocyanines.

4018

INORGANIC CHROMATOGRAPHY ON CELLULOSE. PART XI. A STUDY ON THE SEPARATION OF TANTALUM FROM NIOBIUM AND ITS APPLICATION TO QUANTITATIVE ANALYSIS. F. H. Burstall, Patricia Swain, A. F. Williams, and G. A. Wood. J. Chem. Soc., 1497-1504 (1952) Apr.

A new method is described for the separation of Ta and Nb from each other and from certain other metals. The method is based on their extraction in turn as fluorides, by ethyl methyl ketone in the presence of cellulose adsorbent. Ta is extracted first with ethyl methyl ketone saturated with water. Nb is then extracted with the same organic solvent containing 7.5% (v/v) of HF (40% aqueous solution). It has been shown that, so long as the amount of Ta present does not exceed that of the Nb, a sharp and quantitative separation is obtained. The method has been applied to the separation of the earth acids from their mixtures with other metal ions, and to the determination of Nb and Ta in minerals and alloys. (auth)

SORPTION PHENOMENA

4019

Pomona Coll.

COMPUTATION OF PORE SIZES FROM PHYSICAL ADSORPTION DATA, by Conway Pierce. Apr. 1952. 16p. (NP-3817; U21936)

A derivation of an equation for pore sizes was based on the assumptions that (1) pores are treated as cylinders, (2) the Kelvin equation is applicable for computing the radii from the relative pressures at which desorption occurs, and (3) the film thickness remaining on pore walls after the inner capillary volume is desorbed is the same as on a non-porus surface at the same relative pressure. The results are graphed, tabulated, and discussed for porous glass, silica aerogel, Oulton catalyst, F 12 alumina catalyst, and bone char #452.

4020

Michigan State Coll.

A MAGNETOCHEMICAL INVESTIGATION OF ADSORPTION; TECHNICAL REPORT NO. 1 JUNE 15, 1950–JUNE 30, 1950 AND AUGUST 15, 1950–DECEMBER 1, 1951, by Robert Vander Vennen and Max T. Rogers. [nd] 20p. (NP-3811; Technical Report No. 1)

A study has been made of the magnetic susceptibilities of the typical paramagnetic ions Ni^{++}, Co^{++}, Mn^{++}, Fe^{++} and Fe^{+3} adsorbed on charcoal and on silica gel. The magnetic susceptibility of the adsorbed ions is found in each case to be approximately the same as that of the free paramagnetic ion in solution. Since the covalent coordination compounds of these ions have lower magnetic susceptibilities than the free ions it appears that the ions are bound to the surface by essentially ionic forces. These results are in agreement with other evidence that cations are adsorbed on both charcoal and silica gel by ion exchange with hydrogen ions from the surface. A surface oxide on charcoal appears to provide acidic –OH groups on the charcoal surface similar to those present on the silica gel surface. Attempts to study the magnetic susceptibilities of adsorbed free radicals have so far been unsuccessful because the highly reactive organic materials were destroyed by reaction with the adsorbent or an impurity on the adsorbent. Measurements of the magnetic susceptibility of charcoal have been made using samples prepared in various ways. The mean value observed is about -0.50×10^{-6} cps units, for samples of sugar charcoal freed as far as possible from salts of iron and other ash-forming impurities. The charcoals studies all contained several percent oxygen as surface oxide. The observed susceptibility is close to that of diamond (-0.49×10^{-6}) but not to that of graphite (-3.5×10^{-6}). (auth)

SPECTROSCOPY

4021

Mallinckrodt Chemical Lab., Harvard Univ.

THE MICROWAVE SPECTRUM AND STRUCTURE OF METHYLENE FLUORIDE, by David R. Lide, Jr. [nd] 15p. (NP-3829; U21849)

The K-band microwave spectrum of the slightly asymmetric rotor CH_2F_2 has been recorded and analyzed. Many of the lines appear as close doublets which are due to asymmetry splitting of levels which would be degenerate in the limiting symmetric rotor. The rotational constants determined from the three lines of lowest J values are a = 49,138.4 Mc; b = 10,603.89 Mc; and c = 9249.20 Mc. With the aid of two lines of $C^{13}H_2F_2$ the following structural parameters have been calculated:

$$r_{CF} = 1.358 \pm 0.001 \text{ A} \qquad r_{CH} = 1.092 \pm 0.003 \text{ A}$$

$$\angle FCF = 108° 17' \pm 6' \qquad \angle HCH = 111° 52' \pm 25'$$

Stark effect measurements give a dipole moment of 1.96 ± 0.01 Debye units. (auth)

SYNTHESES

4022

MICRO-SYNTHESES WITH TRACER ELEMENTS. VIII. THE SYNTHESIS OF THIAMIN LABELED WITH C^{14}. D. Lloyd Williams and Anthony R. Ronzio. J. Am. Chem. Soc. 74, 2409-10(1952) May 5.

2-Amino-4-methyl-5-(β-hydroxyethyl)-thiazole-2-C^{14} has been prepared and converted to 4-methyl-5-(β-hydroxyethyl)-thiazole-2-C^{14}, in high yield, by the reduction of the diazonium compound. The deaminated thiazole has been used to prepare C^{14}-labeled thiamin. It has been shown that 2-methyl-4-amino-5-bromomethylpyrimidine hydrobromide reacts with butanol to form an ether. (auth)

4023

MICRO-SYNTHESES WITH TRACER ELEMENTS. VII. THE SYNTHESIS OF 2-METHYL-C^{14}-1,4-NAPHTHOQUINONE (PROVITAMIN K). Arthur Murray III and Anthony R. Ronzio. J. Am. Chem. Soc. 74, 2408-09(1952) May 5.

2-Methyl-C^{14}-1,4-naphthoquinone was synthesized in an over-all yield of 48.7% based on methyl-C^{14} iodide. The reaction sequence involved treatment of 2-naphthyllithium with methyl-C^{14} iodide, followed by oxidation of the hydrocarbon so obtained to the quinone. An improved synthesis of methyl-C^{14} iodide is reported. Conditions for the 85% interconversion of 2-iodonaphthalene and n-butyllithium are given. (auth)

4024

AN IMPROVED SYNTHESIS OF CITRIC ACID-1,5-C^{14}. Seymour Rothchild and Melvin Fields. J. Am. Chem. Soc. 74, 2401(1952) May 5.

The synthesis of citric acid labeled symmetrically in the 1- and 5-positions with C^{14} was accomplished in relatively high yield by the reaction of labeled cyanide with potassium bis-chloromethylglycolate. The citric acid was isolated from the reaction mixture as trimethyl citrate.

4025

MICRO-SYNTHESES WITH TRACER ELEMENTS. V. THE SYNTHESIS OF FORMALDEHYDE-C^{14} AND OF GLYOXYLIC-1,2-C_2^{14} ACID. Arthur Murray, III, C. Wayne Bills, and Anthony R. Ronzio. J. Am. Chem. Soc. 74, 2405-06 (1952) May 5.

Formaldehyde-C^{14} was prepared by catalytic oxidation of methanol-C^{14} by air. Oxalic-1,2-C_2^{14} acid was obtained by oxidation of the formaldehyde-C^{14} and basic fusion of the resultant formic-C^{14} acid. Reduction with Na amalgam was found to be the most efficient method of preparing glyoxylic-1,2-C_2^{14} acid from oxalic-1,2-C_2^{14} acid.

4026

MICRO SYNTHESES WITH TRACER ELEMENTS. VI. THE SYNTHESIS OF SILVER CYANATE LABELED WITH C^{14} AND OF UREA LABELED WITH C^{14} AND N^{15}. D. Lloyd Williams and Anthony R. Ronzio. J. Am. Chem. Soc. 74, 2407(1952) May 5.

The reaction mechanism for the formation of potassium cyanate by the fusion of urea with potassium carbonate has been investigated. The fusion of urea with potassium carbonate-C^{14} has clearly shown that the cyanate carbon is contributed by the urea. Potassium cyanate-C^{14} and silver cyanate-C^{14} have been prepared. Ammonium-N^{15} cyanate-C^{14} has been prepared and has been converted to urea $C^{14}N^{15}$ by Wöhler's reaction. (auth)

4027

PREPARATION OF C^{14}-METHYL LABELED DIMETHYLAMINOETHANOL. Camillo Artom and Marietta Crowder. J. Am. Chem. Soc. 74, 2412(1952) May 15.

2-Methylaminoethanol is refluxed for 6 hours with C^{14}-formaldehyde. Unreacted 2-methylaminoethanol and formaldehyde are destroyed with nitrous acid and alkaline iodine, respectively. C^{14}-Dimethylaminoethanol is recovered by two successive steam distillations (yield 40% based on the isotopic formaldehyde). The solution is of isotopic purity sufficient for biological experiments. No dimethylaminoethanol is formed at pH < 7, unless formic acid is also added. (auth)

4028

THE SYNTHESIS OF CALCIUM D,L-GLYCERATE-1-C^{14}. H. J. Sallach. J. Am. Chem. Soc. 74, 2415(1952) May 5.

In order to study some of the metabolic reactions of glyceric acid in the animal organism, D,L-glyceric acid-1-C^{14} has been prepared as its calcium salt by the addition of $HC^{14}N$ to hydroxyacetaldehyde followed by the hydrolysis of the resulting nitrile. (auth)

4029

SYNTHESIS AND CHROMATOGRAPHIC SEPARATION OF ISOTOPICALLY LABELED DL-THREONINE AND DL-ALLOTHREONINE. Alexander T. Shulgin, Oliver G. Lien, Jr., Emery M. Gal, and David M. Greenberg. J. Am. Chem. Soc. 74, 2427-9(1952) May 5.

The synthesis of isotopically labeled DL-threonine and its alloform has been carried out. It was found that chemical methods on a small scale will not serve for a complete separation of the isomers, which is also true for paper chromatography. Quantitative separation of the isomers was effected by the use of a cation exchange column (Dowex 50). Microbiological techniques confirmed the efficiency of this technique. (auth)

4030

PREPARATION OF OPTICALLY ACTIVE LYSINE LABELLED WITH ^{14}C AND ^{15}N. H. R. V. Arnstein, G. D. Hunter, H. M. Muir, and A. Neuberger. J. Chem. Soc., 1329-34 (1952) Apr.

Syntheses of [carboxy-C^{14}], [α-C^{14}], and [α-N^{15}] lysine are described. The attempted separation of the [α-C^{14}]-labeled enantiomorphs by addition of optically active carrier lysine was not completely successful owing to extensive coprecipitation, which was demonstrated by an enzymic assay of the products. The L-[α-N^{15}] lysine was prepared in 90% yield from $N^{15}H_3$ by utilizing the inversion of configuration which occurs when the D-bromo-acid is treated with ammonia. (auth)

TRACER APPLICATIONS

4031

Wisconsin Univ.

THE EXCHANGE REACTION BETWEEN HYDROGEN CHLO-

RIDE AND ALUMINUM CHLORIDE, by Monte Blau and John E. Willard. [nd] 4p. (AECU-2030)

$AlCl_3$ was synthesized in vacuum by heating Al with fused AgCl containing Cl^{36} and was sublimed onto the walls of a 1-liter flask which served as reaction chamber. On admission of carefully dried HCl, Cl exchange was observed at room temperature in times as short as 10 min. Richardson and Benson (J. Am. Chem. Soc. 73, 5096(1951)) observed that no exchange between HCl and $AlCl_3$ takes place at room temperature and attributed this to the presence of small amounts of moisture in their experiment.

4032

MECHANISM OF THE FORMATION OF THE DIPHENYLIODONIUM ION. J. B. Th. Aten and A. H. W. Aten, Jr. J. Am. Chem. Soc. 74, 2411-12(1952) May 5.

The mechanism of the reaction between a mixture of iodosobenzene and iodoxybenzene with silver hydroxide has been investigated by means of a radiochemical technique. It is shown that the iodine of the diphenyliodonium ion formed is derived from the iodosobenzene and the iodine of the silver iodate from the iodoxybenzene. (auth)

4033

THE BIOSYNTHESIS OF CARBON-14-LABELED COMPOUNDS. II. THE CHROMATOGRAPHIC SEPARATION OF THE MONOSACCHARIDES, DISACCHARIDES, AND TRISACCHARIDES FROM PLANT EXTRACTS. G. R. Noggle and M. Eleanor Schumacher. Plant Physiol. 27, 422-6(1952) Apr.

Fractionation of fructose, glucose, sucrose, and raffinose in synthetic solution or in extract of Canna indica leaves by chromatographic separation on charcoal and Celite is described. (see NSA 4-5670 for Part I)

TRANSURANIC ELEMENTS AND COMPOUNDS

4034

Argonne National Lab.

THE NEPTUNIUM (IV)–NEPTUNIUM (V) COUPLE IN PERCHLORIC ACID. THE PARTIAL MOLAL HEATS AND FREE ENERGIES OF FORMATION OF NEPTUNIUM IONS, by Donald Cohen and J. C. Hindman. June 1951. 12p. (ANL-4783)

The formal oxidation potential for the cell reaction $Np^{+4}(aq) + 2H_2O = NpO_2^+(aq) + 3H^+ + \frac{1}{2}H_2(g)$ has been determined to be -0.7391 ± 0.0010 v in 1M perchloric acid at 25°. $\overline{\Delta H}$ for this reaction is 35.6 ± 0.3 kcal, and $\overline{\Delta S}$ is 62.3 ± 1 e.u. Based on these and previously reported measurements, a potential scheme for the neptunium ions in 1M perchloric acid is given. Calculations have been made of the partial molal heats and free energies of formation of the various neptunium ions. Entropies of these ions are given. (auth)

4035

Argonne National Lab.

OXIDATION POTENTIALS OF THE NEPTUNIUM (III)-(IV) AND THE NEPTUNIUM (V)-(VI) COUPLES IN PERCHLORIC ACID, by Donald Cohen and J. C. Hindman. June 1951. 11p. (ANL-4782)

The oxidation potentials of the Np(III)-Np(IV) and Np(V)-Np(VI) couples have been measured as a function of temperature in 1M perchloric acid solution. The formal potential for the cell reaction $Np^{+3}(aq) + H^+ = Np^{+4}(aq) + \frac{1}{2}H_2(g)$ is -0.1551 ± 0.0010 volts at 25°. For this reaction at 25°, $\overline{\Delta H}$ is -5.7 ± 0.2 kcal and $\overline{\Delta S}$ is -31.2 ± 0.8 e.u. For the reaction $NpO_2^+(aq) + H = NpO_2^{++}(aq) + \frac{1}{2}H_2(g)$ the formal potential is -1.1373 ± 0.0010 volts at 25°. $\overline{\Delta H}$ for this reaction at 25° is 28.1 ± 0.2 kcal, and the partial molal entropy change is 6.4 ± 0.6 e.u. (auth)

4036

Argonne National Lab.

CRYSTAL STRUCTURE STUDIES OF NEPTUNIUM METAL AT ELEVATED TEMPERATURES, by W. H. Zachariasen. Apr. 14, 1952. Decl. May 27, 1952. 12p. (AECD-3393; ANL-FWHZ-203)

The orthorhombic room-temperature form of neptunium metal (α–Np) is found to be stable up to 278°C. Unit-cell dimensions and thermal-expansion coefficients in the range 20°C to 278°C are given. At 278 ± 5°C α–Np transforms into β–Np which is tetragonal. The tetragonal modification is stable up to about 540°C. At 313°C the dimensions of the unit cell containing four atoms are $a_1 = 4.897 \pm 0.002$ A, $a_3 = 3.388 \pm 0.002$ A, and the calculated density at this temperature is $\rho = 19.36$. The atomic positions in the β–Np structure are: 2 Np(I) in (0 0 0)(½ ½ 0); 2 Np(II) in (½ 0 u)(0 ½ ū) with $u = 0.375 \pm 0.015$. As in α–Np each atom forms four short bonds. There is strong indication of a transition point at about 550°C. Above this point the metal seems to be cubic-body-centered (γ–Np) with a = 3.52 A, and this phase is presumably stable up to the melting point at 640°C. The structural relationships between the three forms of neptunium metal are discussed. (auth)

4037

Argonne National Lab.

THE ENTROPY AND LOW-TEMPERATURE HEAT CAPACITY OF NEPTUNIUM-DIOXIDE, by Edgar F. Westrum, Jr., J. B. Hatcher, and Darrell W. Osborne. Apr. 1952. 16p. (ANL-4808)

This report is based on an earlier one issued as AECD-2863 and abstracted in Nuclear Science Abstracts as NSA 5-588. Tabulated values are only slightly revised.

TRITIUM AND TRITIUM COMPOUNDS

4038

TRITIUM; HYDROGEN ISOTOPE OF MASS 3. BIBLIOGRAPHY AND REVIEW. P. Verzaux. J. phys. radium 13, 94-106(1952) Feb. (In French)

After a brief history of research on T, the author reviews the preparative methods, radioactive properties, and principal nuclear reactions, briefly examines the theories of the binding energy and magnetic moment of the triton, and considers the physical properties of T as compared with those of the other H isotopes and the equilibrium between H and T in the presence of H_2O. The review concludes with several tracer applications of T in chemistry and biology. 79 references.

URANIUM AND URANIUM COMPOUNDS

4039

A CORRECTION TO "MAGNETOCHEMISTRY OF THE HEAVIEST ELEMENTS. PART V. URANIUM TETRAFLUORIDE–THORIUM TETRAFLUORIDE SOLID SOLUTIONS." J. K. Dawson. J. Chem. Soc., 1185-6(1952) Mar. (cf. NSA 6-857)

Corrections of arithmetical errors have resulted in considerably altered values of the susceptibilities and magnetic moments of the U ion in the various UF_4-ThF_4 solid solutions. Revised tables II and III are given.

4040

PHOTOCHEMICAL STUDIES WITH THE GASEOUS FLASH DISCHARGE. I. URANYL-OXALATE ACTINOMETRY AT HIGH INTENSITIES. M. I. Christie and G. Porter. Proc. Roy. Soc. (London) A212, 390-7(1952) May 7.

The possibility of applying uranyl-oxalate actinometry at the intensities produced by high-energy flash discharges is investigated. It is shown that the photochemical decomposition of oxalate produced by a high-energy flash is directly proportional to intensity over an intensity range of 1000. Since the rate of decomposition at the lowest flash intensity is comparable with that calculated for the highest intensity previously studied in uranyl-oxalate actinometry, it is concluded that the quantum yield of the uranyl-oxalate system is unchanged up to intensities 10^3 times greater than those

previously investigated. The available output in the ultraviolet region is given for several experimental arrangements. (auth)

ENGINEERING

4041
Acoustic Research Lab., Harvard Univ.
THE TENSILE STRENGTH OF LIQUIDS: A REVIEW OF THE LITERATURE, by F. G. Blake, Jr. June 11, 1949. 84p. (NP-3800; Technical Memo No. 9; U6606)

4042
North American Aviation, Inc.
A GENERAL METHOD FOR THE DETERMINATION OF THE THERMAL STRESSES IN A COMPOSITE MEDIUM, by J. Brandstatter. Issued May 23, 1952. 20p. (NAA-SR-184)

The present paper treats the formulation and method of solution of thermal stress problems which fall into a two-dimensional category. The method of solution utilizes the theory of functions of a complex variable, and it is shown that the problem reduces to a pair of functional equations. The solution of the functional equations entails the construction of two analytic functions for the determination of the stresses. A further generalization incorporates the effects of the temperature dependence of the coefficient of linear thermal expansion. (auth)

AEROSOLS

4043
Colloid Research Labs., Columbia Univ.
INVESTIGATION OF PARTICLE SIZE BY DIFFERENTIAL SETTLING-FORWARD ANGLE SCATTERING AEROSOL CAMERA; MAY 31 THRU AUGUST 31, 1951, by Joseph T. Benedict and P. K. Lee. Aug. 31, 1951. 11p. (NP-3892; ATI-122991; Progress Report No. 7)

HEAT TRANSFER AND FLUID FLOW

4044
Babcock and Wilcox Co.
EXPERIMENTAL INVESTIGATION OF HEAT TRANSFER TO LIQUID LITHIUM AND CORROSION STUDIES OF LIQUID METAL SYSTEMS; PROGRESS REPORT JANUARY 15, 1952 – FEBRUARY 15, 1952, by A. W. Dana, Jr. and O. H. Baker. Feb. 15, 1952. 7p. (DC-52-2-24; ES-782-783; Report No. 5226)

4045
Stanford Univ.
LOSS COEFFICIENTS FOR ABRUPT CHANGES IN FLOW CROSS SECTION WITH LOW REYNOLDS NUMBER FLOW IN SINGLE AND MULTIPLE TUBE SYSTEMS, by W. M. Kays. Jan. 1, 1950. 29p. (NP-3901; Technical Report No. 9; U-9356)

In testing for the flow friction characteristics of compact heat exchanger surfaces concurrent with heat transfer tests, more precise data on the flow contraction and expansion loss coefficients are required than are available in the literature. This report presents a theory for evaluating these coefficients for both single- and multiple-tube systems for various contraction and expansion geometries. The analysis takes into account the contraction and expansion area ratio and the velocity distribution. Results of experiments for the Reynolds number range 500-20,000 are presented which compare well with the analysis. This report is a summary and extension of a technical report no. 1, September 15, 1948. The analysis was extended to cover both single and multiple tube systems, the results of analysis are presented in convenient graphical form for various contraction and expansion geometries, and additional experiments on a single tube system with water as a working medium are reported. (auth)

4046
North American Aviation, Inc.
FLOW OF GASES IN CONSTANT-AREA PASSAGES WITH FRICTION AND ARBITRARY HEAT ADDITION, by M. P. Heisler and H. Sletten. Issued May 15, 1952. 29p. (NAA-SR-177)

It has been hypothesized that pressure loss across a gas-cooled, constant-area passage does not necessarily depend on the distribution of heat flux along the passage. The hypothesis was supported by calculating pressure loss for three different modes of heat input: uniform surface temperature, uniform power generation, and sinusoidal power generation. In this paper, it is shown by means of a mathematical formulation based on the total momentum parameter that, at any given point, the state parameters of the fluid (these determine pressure loss) are essentially functions of the total heat transferred to the fluid up to the point in question. Then, accepting this as a premise, it is shown how an assumed exponential fluid temperature variation can be used to predict flow phenomena for arbitrary flux distributions. The assumption of an exponential temperature variation reduces the momentum equations—which in general are not integrable—to an integrable form, and leads to a simple, flexible solution useful for analyzing flow in passages of any arbitrary degree of surface roughness. (auth)

4047
Lewis Flight Propulsion Lab., NACA
DISPLACEMENT EFFECT OF A THREE-DIMENSIONAL BOUNDARY LAYER, by Franklin K. Moore. June 1952. 15p. (NACA-TN-2722)

A method is described for determining the "displacement surface" of a known three-dimensional compressible boundary-layer flow in terms of the mass-flow defects associated with the profiles of the two velocity components parallel to the surface. The height of the displacement surface above the body surface for flow about a yawed infinite cylinder is shown to be equal to the height characterizing the mass-flow defect of the chordwise velocity profile. The displacement surface height is shown to differ, in general, from that associated with the resultant mass-flow defect, even at stagnation points of the secondary flow. Numerical values are found for the known three-dimensional boundary-layer flow about a cone at a small angle of attack to a supersonic stream. (auth)

4048
Oak Ridge National Lab.
THEORETICAL AND EXPERIMENTAL ANALYSES OF NATURAL CONVECTION WITHIN FLUIDS IN WHICH HEAT IS BEING GENERATED. PART I. HEAT TRANSFER FROM A FLUID IN LAMINAR FLOW TO TWO PARALLEL PLANE BOUNDING WALLS; A SIMPLIFIED VELOCITY DISTRIBUTION WAS POSTULATED, by D. C. Hamilton, H. F. Poppendiek, and L. D. Palmer. Dec. 18, 1951. 21p. (CF-51-12-70)

This memorandum describes the preliminary phase of a program to investigate the temperature and velocity fields in confined fluid systems in which heat is being generated. A theoretical analysis for a parallel plate, laminar flow system is given and the significant parameters involved are discussed. The parallel experimental work will be discussed in succeeding memoranda. (auth)

4049
Oak Ridge National Lab.
THEORETICAL AND EXPERIMENTAL ANALYSES OF NATURAL CONVECTION WITHIN FLUIDS IN WHICH HEAT IS BEING GENERATED. PART II. HEAT TRANSFER

FROM A FLUID IN LAMINAR FLOW TO TWO PARALLEL PLANE BOUNDING WALLS, by R. F. Redmond, D. C. Hamilton, and L. D. Palmer. Jan. 22, 1952. 22p. (CF-52-1-1)

This analysis presents solutions for the temperature and velocity fields which exist in a fluid flowing laminarly by natural convection and experiencing internal heat generation. The limitations of the solutions are described and the significant parameters are discussed. (auth)

4050

Oak Ridge National Lab.

THEORETICAL AND EXPERIMENTAL ANALYSES OF NATURAL CONVECTION WITHIN FLUIDS IN WHICH HEAT IS BEING GENERATED. PART III. HEAT TRANSFER FROM A FLUID IN LAMINAR FLOW TO THE WALLS OF A CYLINDRICAL TUBE; A SIMPLIFIED VELOCITY DISTRIBUTION WAS POSTULATED, by D. C. Hamilton, R. F. Redmond, and L. D. Palmer. Jan. 11, 1952. 16p. (CF-52-1-2)

4051

A NEW APPROXIMATION FOR THE STUDY OF SUBSONIC AND TRANSSONIC FLOW. Paul Germain and Marc Liger. Compt. rend. 234, 1846-8(1952) May 5. (In French)

A method recently described (Compt. rend. 234, 592(1952); NSA 6-2070) for reducing the approximate equations of gas flow to solutions of the Tricomi equation is applied to several simple types of flow having velocities up to slightly above the speed of sound.

4052

SEVERAL CONTRIBUTIONS TO THE HOT-WIRE METHOD. Gottfried Dätwyler. Compt. rend. 234, 1848-50(1952) May 5. (In French)

For use in air-turbulence investigations, simple equations are derived for calibration of the hot wire by variations in current rather than by variations in air flow, for current in an infinitely long wire as a function of Reynolds' number (in good agreement with experiment), and for the correction arising from temperature differences between the still air at calibration and the flowing air.

MATERIALS TESTING

4053

Stanford Univ., Div. of Engineering Mechanics

COMBINED STRESS EXPERIMENTS IN PLASTICITY, by Aris Phillips. Jan. 15, 1952. 26p. (NP-3852; Technical Report No. 11; U-20919)

Thin-walled cylindrical tubes of annealed pure Al 2S-O were subjected to combined tension and torsion in the plastic region at variable stress ratios. The theory of plastic flow represented experimental results much more accurately than the plastic-deformation theory. (See also U18521) (NRS abst.)

TRACER APPLICATIONS

4054

ADVANTAGES OF RADIOACTIVE TRACERS IN INVESTIGATING WEAR OF LAMINATED PLASTICS. Maurice Exran. Compt. rend. 234, 1947-9(1952) May 12. (In French)

Wear of plastic gears, pulleys, and bearings can be determined by pile exposure, resulting in activation of any NaCl present, operation under load, and measurement of the activity in the oil used. The part can be immersed in NaCl solution prior to activation to intensify the radioactivity. Only a few minutes operation are required, in contrast to at least several days for wear studies by dimensional variations.

VACUUM SYSTEMS

4055

STRAIGHT-LINE VACUUM VALVE. Gilles and Johannin. J. phys. radium 13, 109(1952) Feb. (In French)

A valve that has given uninterrupted service for a year in a vacuum spectrograph is described. A quarter-turn causes a cam to force two plates inset with rubber against the respective openings to the vacuum chambers. The valve is 45 mm thick and could be reduced to 20 mm without difficulty.

WASTE DISPOSAL

4056

Institute of Engineering Research, Univ. of Calif.

REMOVAL OF RADIOISOTOPES BY SEWAGE TREATMENT PROCESSES; PROGRESS REPORT NO. 1, MAY 1, 1951 TO MARCH 31, 1952, by Warren J. Kaufman, Gerhard Klein, and Harold B. Gotaas. Apr. 15, 1952. 27p. (AECU-2035; Progress Report No. 1)

The removal of P^{32} by the activated sludge process was studied both in batch and continuous operation. The effectiveness of the process varied widely as a result of changes imposed upon the amount and nature of BOD loading, suspended solids concentration, stable phosphate concentration and aeration period. In the course of treating a normal domestic sewage in the conventional treatment plant a high reduction of the radioactive phosphorus concentration may not be expected. The results presented permit the following fundamental observations. Phosphate is assimilated by activated sludge as a consequence of cell growth and isotopic exchange. Uptake of P^{32} by cell growth predominates at low sludge ages while isotopic exchange is favored by a high concentration of suspended solids. The BOD/N ratio appears to be more critical in the removal of radioactive phosphorus than in the reduction of BOD. Removal of P^{32} is a function of the stable phosphorus concentration in the waste. Removals as high as 98% are possible at stable phosphorus levels of approximately one ppm. However, at phosphorus concentrations of 6 ppm or higher, P^{32} removals may be 20% or less. The phosphorus exchange rate between the solution and solid phases for an activated sludge developed on 6.5 ppm phosphorus is approximately 0.35 ppm P per hour for the first seven hours after feeding. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CORROSION

4057

Oak Ridge National Lab. (Y-12)

TESTING AND EXAMINATION OF THERMAL CONVECTION LOOPS OPERATED WITH LITHIUM AND LEAD, by R. B. Day and A. deS. Brasunas. Aug. 20, 1951. 18p. (Y-F31-4)

4058

Oak Ridge National Lab.

CORROSION TESTS ON VARIOUS ALLOYS IN AMMONIUM BIFLUORIDE SOLUTIONS, by J. L. English. Mar. 9, 1950. 7p. (CF-50-3-216)

Corrosion tests were conducted with Hastelloy C, Carpenter 20, welded and non-welded 309 stainless steel, and 316 stainless steel in 2.51M ammonium bifluoride solution containing 5, 20, and 35 percent nitric acid or 5, 12.5, and 20%

hydrochloric acid at room temperature for seven days. The tests were operated with vigorous aeration. Carpenter 20 exhibited the best corrosion resistance to all six types of solution. Corrosion rates ranged from 0.01 to 11.0 mils/year. The maximum rate was obtained in the 20 percent nitric acid solution. Hastelloy C showed the next best corrosion resistance to all six solutions with corrosion rates ranging from 0.1 to 12.6 mils/year. Maximum corrosion attack was encountered in the 35 percent nitric acid solution. The best corrosion resistance to the nitric acid solutions only was shown by Type 309 stainless steel, welded or non-welded. Corrosion rates averaged 0.03 to 0.10 mil/year. Type 316 stainless steel was next best in these solutions with corrosion rates of 0.04 to 0.40 mil/year. The best corrosion resistance to the hydrochloric acid solutions was shown by Hastelloy C, 0.1 to 6.1 mil/year, and Carpenter 20, 0.2 to 7.0 mil/year. Welded 309 stainless steel showed equivalent corrosion resistance, and in some cases better, to that of non-welded 309 stainless steel in all six solutions. (auth)

4059

Naval Engineering Experiment Station, Annapolis

CHEMICAL CORROSION TESTS OF WELDED SAMPLES OF TYPE 347 STAINLESS STEEL (Supplementary report), by H. C. Ellinghausen. May 15, 1951. 3p. (U-19540; EES Report No. 4A(12)966870)

Welded samples of type 347 stainless steel sensitized at 1100°F for 2, 6, and 24 hr sustained knife-line attack when they were exposed in boiling 65% HNO_3 (Huey test). The degree of attack increased with sensitizing time from 192 to 240 hr. Similar samples sensitized at 1300°F for 2 and 6 hr also suffered knife-line attack. However, the degree of attack decreased with increase in time. A specimen held for 24 hr at 1300°F and samples sensitized at 800°F for 2, 6 and 24 hr showed no evidence of knife-line attack. None of the base-metal control samples were susceptible to localized attack. (cf. TIP U17931) (NRS abst.)

4060

Los Alamos Scientific Lab.

MATHEMATICAL STUDIES OF GALVANIC CORROSION. PART III. EFFECTS OF POLARIZATION, by James T. Waber. Mar. 14, 1952. 13p. (LA-1386)

Fourier series and the Fourier cosine integral have been used to investigate the effects of polarization on galvanic corrosion. Three commonly-occurring situations were studied and, in each, polarization was shown to limit the intensity of the corrosion attack. Specifically, Wagner's polarization parameter, k, was assumed to be identical in the anodic and cathodic region. (auth)

4061

BEHAVIOR OF LIGHT ALLOYS UNDER MARINE CORROSION. II. André Guilhaudis. Rev. aluminium 29, 127-33 (1952) Apr. (In French)

After describing the marine-corrosion test stations at Salin de Giraud and Saint Jean de Luz, France, the author reviews the behavior of nonprotected Al and light alloys, Al-Mn, Al-Mg, Al-Mg-Si, Al-Cu-Mg when submitted to spray, permanent immersions, and alternated immersions-emersions. The author points out of the influence of work-hardening, copper, and tension in the case of Al-Mg alloys, of the quenched-tempered state in the case of Al-Mg-Si alloys, and of thickness, partial annealing, and orientation of the test piece in the case of Al-Cu-Mg alloys. (auth)

GEOLOGY AND MINERALOGY

4062

National Academy of Sciences

REPORT OF THE COMMITTEE ON THE MEASUREMENT OF GEOLOGIC TIME, 1950-1951. National Academy of Sciences and National Research Council. 1952. 140p. (NP-3801)

Progress during the period April 1, 1950 to April 1, 1951 on age determinations by isotopic ratios, C^{14} content, etc. is summarized. An annotated bibliography, compiled by John Putnam Marble, of 390 recent articles related to the measurement of geologic time is included. Also appended are 6 abstracts of papers delivered at the symposium on measurement of geologic time held by the American Geophysical Union, Apr. 30 to May 2, 1951; extracts from the preliminary report of the Committee on the Measurement of Geological Time in India, 1947-50; and a report (to the Commission on Atomic Weights, International Union of Chemistry, Sept. 1951) by J. P. Marble entitled "Natural Variations in Isotopic Ratios of the Chemical Elements." The latter report includes 245 references.

4063

SIMULTANEOUS GAMMA-RAY AND NEUTRON LOGGING. Gilbert Swift. Geophysics 17, 387-94(1952) Apr.

Newly developed instrumentation for radioactivity well logging is described whereby two curves, the gamma-ray curve and the neutron curve, are made simultaneously, together with a record of the casing collar positions, on one upward passage of the logging instrument. A functional description of all of the system elements is provided, showing how the resulting log is continuously drawn in the surface vehicle on a multi-pen recorder, with consequent saving in rig-time and elimination of possible depth discrepancy between curves, which may exist where succesive runs are required. The application of radioactivity logs to production problems is briefly discussed. (auth)

4064

FRENCH URANIFEROUS MINERALS. A. Esme. Industrie chimique 39, 77(1952) Mar. (In French)

The following U minerals are found in France; bayleyite, kasolite, parsonsite, renardite, uranopilite, β-uranotile, bassetite, bequerelite, curite, ianthinite, phosphouranylite, α-uranotile, and brannerite. Location and occurrence of the minerals are described briefly.

4065

ABSOLUTE AGES OF RADIOACTIVE MINERALS FROM THE APPALACHIAN REGION. John Rodgers. Am. J. Sci. 250, 411-27(1952) June.

All available absolute age determinations made on radioactive minerals from the Appalachian region have been re-estimated in the light of presently accepted formulas and constants. They appear to record four orogenies. Two, roughly 800 and 600 million years ago, were Pre-Cambrian and are recorded only along the western edge of the crystalline Appalachians. The Taconian, 350 million years ago, affected a belt in the western part of the crystalline Appalachians and may also have been represented in eastern Massachusetts. The Acadian, 260 million years ago, affected eastern New England. Curiously the Appalachian orogeny is at best feebly recorded. The igneous rocks of the late Triassic appear to be about 170 million years old. (auth)

4066

THORIUM CONTENT OF ALLANITE. R. Coppens. Bull. soc. franç. minéral. et cristal. 75, 59-62(1952) Jan.-Mar. (In French)

The absorption coefficient $K' = 0.85/\Sigma\, Cs/A$, where C, s, and A are the concentration, stopping power, and atomic weight of each constituent, was calculated to be 16.8 ± 0.5 for allanite. From a nuclear-emulsion measurement of 0.60 α particles/cm^2/sec, the Th content of allanite is deduced to be 1.35% within about 10%.

METALS AND METALLURGY

4067

Pennsylvania State Coll.

FATIGUE STRENGTHS OF 14S-T4 ALUMINUM ALLOY SUBJECTED TO BIAXIAL TENSILE STRESSES, by Joseph Marin and W. P. Hughes. June 1952. 24p. (NACA-TN-2704)

The purpose of this investigation was to determine the influence of biaxial tensile stresses on the fatigue strength of a 14S-T4 aluminum alloy when subjected to various ratios of biaxial stresses. The effect upon the fatigue strength of varying the ratios of biaxial stresses was studied. The biaxial fatigue stresses were produced by applying simultaneously a pulsating internal pressure and a fluctuating axial tensile load to a thin-walled tabular specimen. The maximum and minimum values of the longitudinal and circumferential stresses were kept in phase by adjusting the testing machine. The fatigue strengths and S-N diagrams were obtained up to about 10^7 cycles for four principal stress ratios. (NACA abst.)

4068

Arcos Corp.

THE INCIDENCE OF CRACKING IN THE WELDING OF TYPE 347 STEELS, by Lorin K. Poole. May 22, 1952. (NYO-3494)

The major fabricators of stainless steels were visited to determine the nature and extent of cracking difficulties encountered in the welding of Type 347 steel. Out of the twenty-three fabricators all reported having seen crater cracks, 78% hot short cracks or microfissuring, 39% base metal cracks, 22% cracks after stress relief, and 13% have observed "star" cracks. Fully austenitic welds are most susceptible to cracks. Electrodes having a lime type coating and whose compositions are balanced to give at least 5% ferrite in non-dilution weld pads are least susceptible to microfissures and "star" and crater cracks. Differences of opinion exist as to the causes of base metal cracks and the various types of cracks observed after stress-relief. (auth)

4069

Battelle Memorial Inst.

INTERIM TECHNICAL REPORT ON CHEMICAL SURFACE TREATMENT OF TITANIUM TO WATERTOWN ARSENAL, by H. A. Pray, Paul D. Miller, and R. L. Gibbs. Jan. 31, 1952. 43p. (NP-3808; U22071)

The literature was surveyed for chemical and electrochemical reactions of Ti solutions to obtain useful surface treatments and coatings for Ti. Preliminary tests were performed on the production of oxide coatings. Coatings found by visual, microscopic, and electrical examination to have appreciable thickness, continuity, and durability were tested for resistance to seizing and galling. Anodic treatments favored oxide formation more than did chemical action. Solutions giving outstanding coatings contained NaOH, $NaAlO_2$, Na_2O_2, $NaClO_3$, HBF_4, HCOOH, or NH_4OH as the active bath ingredient; the first 4 baths furnished the best coatings. Seizure tests employing a loaded-steel-ball abrading surface and a 70-Tsi contact pressure showed that lubricated anodized Ti had good wear properties as compared with bare metal. Coatings from the HPF_4 bath were least resistant to galling. Adhesion of olive-drab paint was better on anodized sheets coated in NaOH and $NaAlO_2$ baths than on bare Ti. (NRS abst.)

4070

Brown Univ., Graduate Div. of Applied Mathematics

STRESS-STRAIN RELATIONS IN THE PLASTIC RANGE – A SURVEY OF THEORY AND EXPERIMENT and BIBLIOGRAPHY, by D. C. Drucker. Dec. 1950. 312p. (NP-3873; U16947; U16948; Report No. A11-S1)

4071

Battelle Memorial Inst.

THE WELDING OF BETA-STABILIZED TITANIUM ALLOYS; PROGRESS REPORT, by G. E. Faulkner, G. B. Grable and C. B. Voldrich. Mar. 18, 1952. 12p. (NP-3818; U22104)

Four series of binary Ti-base alloys containing the β-stabilizing elements Cr, Fe, Mn, and Mo were selected for an investigation of welding characteristics. Chemical analyses indicated that Cr, Fe, Mn, and arc-melted Ti sponge were suitable basic materials for base plates and filler metals. Master alloys of 35% Ti-65% Cr, 50% Ti-50% Fe, and 50% Ti-50% Mn were prepared from which lower-percentage alloys for final plates and filler rods will be fabricated. The welding and metallurgical testing procedures are outlined. (NRS abst.)

4072

Carnegie Inst. of Tech.

RESEARCH AND DEVELOPMENT OF EFFECT OF RANGE OF STRESS AND PRESTRAIN ON THE FATIGUE PROPERTIES OF TITANIUM AND ITS ALLOYS. Mar. 1, 1952. 34p. (NP-3813; U21987)

Two rotating-beam fatigue machines were constructed for studying the effects of stress range and prestrain on Ti and its alloys. Loadings from pure tension to pure bending, in any combination, can be obtained; changes in loading can be made during a test. Dynamic calibration showed that rotating the motor at 1800 rpm produces the same stress limits as slowly rotating the specimen by hand. Static tests indicated agreement between the calculated observed stresses in pure bending and tension when the apparent modulus was used to convert the average strain to the applied bending moment. For combined bending and tension, the observed and calculated stresses agreed when corrections were made for the counteracting moment produced by the tensile load. Calibration data are summarized in tables and graphs; working formulas and a nomographic chart for analyzing combined stresses are presented. (NRS abst.)

4073

Wright Air Development Center

TITANIUM-NICKEL PHASE DIAGRAM, by John P. Nielsen and Harold Margolin. Wright Air Development Center and New York Univ. Oct. 1951. 23p. (AF-TR-6596(pt.I))

The Ni-Ti phase diagram has been investigated up to 90% Ni, and the features up to 40% Ni have been established. An eutectic horizontal is found between 950° and 965°C, and an eutectoid transformation between 750° and 775°C. Little solubility of Ni in alpha Ti is indicated. Preliminary experiments on high Ni alloys indicate a possible error in the Wallbaum diagram in the range 55 to 60% Ni. Because of possible contamination, further work is necessary to determine whether any difference actually exists. Also included are accounts of alloy preparations, heat treatment, polishing, and x-ray techniques employed in this investigation. (auth)

4074

Radiation Lab., Univ. of Calif.

STUDIES OF MATERIALS AT HIGH TEMPERATURES, by Russell Keith Edwards. Mar. 12, 1952. Decl. Apr. 23, 1952. 113p. (AECD-3394; UCRL-1639)

This thesis embodies three somewhat unrelated studies. In the first section a study of the intermetallic phases in the system U-Bi is presented. The second section describes a liquid-sodium pump which has been developed and which, through its capacity for removal of oxidizing gases, makes possible the maintaining of very high purity inert atmospheres in working chambers where highly reactive materials must be handled. The third section presents a study of the stability of solid and gaseous SiO. The appendix describes

the determination of the thermal conductivity of CeS, UC, and UN and the specially designed apparatus for the studies is illustrated.

4075

Cryogenic Lab., Ohio State Univ.

THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF THE GROUP VI ELEMENTS: TUNGSTEN (WOLFRAM), MOLYBDENUM AND CHROMIUM, by Esther Richert, C. W. Beckett, and H. L. Johnston. Dec. 1, 1949. 80p. (NP-3871; Technical Report No. 102-AC49/12-100)

4076

Fansteel Metallurgical Corp.

FINAL REPORT; DEVELOPMENT OF A PROTECTIVE COATING FOR TITANIUM ALLOYS; MAY 18, 1951 THRU FEBRUARY 29, 1952, by Stanley Kluz, Caesar Kalinowski, and Ralph Wehrmann. Mar. 28, 1952. 35p. (NP-3790; Laboratory Record Book No. 334; U21633)

The research program includes preparation of compounds of Ti and Si, determination of their high-temperature resistance to oxidation, accumulation of x-ray and metallographic data, and the preparation and testing of coated specimens. Attempts to prepare Ti_2Si, TiSi, $TiSi_2$ (I), Ti_5Si_3 by heating the elemental powders resulted in the compounding of only I and Ti_5Si_3 (II), and an unknown phase, as determined by x-ray analysis. The silicide powders could be consolidated by powder metallurgy techniques. The oxidation resistance of I was outstanding; no significant change was evident during 1048 hr in air at 1000°C. Theoretical densities of 4.13 ± 00.1 g/cm^3 and 4.32 ± 0.01 g/cm^3 were computed for I and II, respectively. Coating Ti by pack method which involved submerging the specimens in Si powder and heating in H proved unsatisfactory. Coatings obtained by painting Ti strips with a suspension of 4 parts Si powder, and 1 part glyptal suspended in a mixture of 7 parts Me_2CO and 3 parts alcohol provided some protection. (NRS abst.)

4077

THE ELECTRICAL CONDUCTIVITY OF LIQUID SELENIUM AND SELENIUM-TELLURIUM MIXTURES. B. Lizell. J. Chem. Phys. 20, 672-6(1952) Apr.

The electrical conductivity of liquid selenium and selenium-tellurium mixtures was studied in detail. Measurements in the temperature range 230° to 500°C from d-c to 1 Mc indicated the conductivities to be frequency-independent at low field strength (<5 v/cm). For larger fields (5 to 250 v/cm) the conductivity increases and higher d-c than a-c values result. Adding increasing amounts of tellurium to selenium produced a continuous rise in conductivity from 1.26×10^{-4} ohm^{-1} cm^{-1} (pure Se) to 2.08×10^{-1} ohm^{-1} cm^{-1} (50.3 percent Se, 49.7 percent Te) at 480°C and a decrease in activation energy from 1.14 ev to 0.84 ev. Comparatively good reproducibility was obtained in the measurements. An attempt to study ionic migration in liquid selenium by tracer methods has thus far not given satisfactory results. The conductivity values obtained for pure selenium are in good agreement with those presented by Henkels but disagree with those of Borelius. The electrical characteristics of liquid selenium and selenium-tellurium mixtures indicate that hole conduction as pictured for selenium in the solid state cannot be considered as an adequate explanation of the conduction process in these liquids. A complex mixture of conduction by electrons, holes, and ions is believed to exist. (auth)

4078

DETERMINATION OF METALLIC BERYLLIUM AND BERYLLIUM CARBIDE IN BERYLLIUM METAL. Walter A. Bergholz. J. Research. Natl. Bur. Standards 48, 201-5 (1952) Mar.

A method is described for the determination of metallic beryllium and beryllium carbide in beryllium metal. The beryllium metal is dissolved in potassium hydroxide solution at a controlled rate of solution. The liberated hydrogen and methane are burned with copper oxide in an atmosphere of nitrogen. The water and carbon dioxide formed are absorbed in magnesium perchlorate and ascarite, respectively, and determined by weighing. The metallic beryllium is calculated from the water, corrections being made for any calcium or aluminum present as impurities that also liberate hydrogen in caustic solution; in case beryllium carbide is determined, a correction may also be made for the water formed by the combustion of methane. The beryllium carbide is calculated as Be_xC from the carbon dioxide formed. (auth)

4079

RARE EARTHS BOOST CREEP RESISTANCE OF Mg-Zr ALLOYS. W. G. Patton. Iron Age 169, 134-6(1952) May 22.

A study is made of alloys having high strength-weight ratios and ability to meet increasing stresses at elevated temperatures. Addition of 2 to 4% of rare earth metals to Mg-Zr alloys produces alloys having as much as 5 times the creep strength of the older Mg-Al alloys. The analysis, solution heat treatment, and grain size of several Mg-Zr alloys containing rare earths are given. Room and elevated-temperature properties of the same alloys are shown. A comparison is made of average tensile properties at room temperature of separately cast Mg-rare earth base alloys. The range of creep limits is given.

4080

A STUDY OF COLD-WORKED ALUMINIUM BY AN X-RAY MICRO-BEAM TECHNIQUE. I. MEASUREMENT OF PARTICLE VOLUME AND MISORIENTATIONS. II. MEASUREMENT OF SHAPES OF SPOTS. III. THE STRUCTURE OF COLD-WORKED ALUMINIUM. P. B. Hirsch and J. N. Kellar. Acta Cryst. 5, 162-75(1952) Mar.

I. When Al is cold-rolled, the original grains break up into smaller particles. X-ray-microbeam back-reflection photographs permit the determination of the mean particle size and misorientation, and of their variation with degree of deformation, time after rolling, and purity of specimen. It is found that for spectroscopically pure Al a limiting particle size of ~2 μ is reached after ~10% reduction in thickness, and that the total range of misorientations of the particles in the original grain is several degrees, while the mean angle between neighboring particles is estimated to be ~2°. The particle size decreases slightly with time after rolling; for impure Al, both the limiting particle size and the mean angle between adjacent particles are smaller. II. A method is described for obtaining from the shapes of the spots on spotty-ring photographs approximate values of the physical broadenings of the reflections. The method is used to determine the broadenings of the reflections from particles of specimens of cold-rolled Al examined by the microbeam technique. It is found that the physical broadenings decrease with time after rolling. The general application of the method to spotty-ring and Laue photographs from stationary specimens is discussed. III. The results reported in I and II are discussed in the light of present theories of plastic deformation of metals. It is estimated that there are ~10^{10} dislocations/cm^2 in the boundaries between particles in cold-worked aluminum. The physical broadenings of the x-ray reflections from the particles are discussed, and it is concluded that the particles are distorted. Some deductions are made about the possible types of distortion in the particles. The formation of particles is considered to be due to polygonization. The changes which occur during recovery and those induced by impurities are interpreted on this basis. (auth)

4081
INTERPRETATION OF THE ORIENTATION DEPENDENCE OF THE HARDENING CURVES OF ALUMINUM SINGLE CRYSTALS. P. Haasen and G. Leibfried. Z. Physik 131, 538-43(1952). (In German)

In general, only the glide system of maximum shearing stress appears macroscopically in plastic deformation. It is assumed that the other glide planes develop dislocations that hinder slipping in the regular glide system, resulting in increased hardening. A deformation rule derived from this concept shows a dependence of deformation on the orientation of the axis of tension, in good qualitative agreement with experimental data on hardening of pure Al.

PHYSICS

4082
Research Lab. of Electronics, Mass. Inst. of Tech.
METHODS OF MEASURING THE PROPERTIES OF IONIZED GASES AT HIGH FREQUENCIES. II. MEASUREMENT OF ELECTRIC FIELD, by David J. Rose and Sanborn C. Brown. Jan. 22, 1952. 9p. (NP-3814; Technical Report No. 223; U22070)

Three general procedures are outlined whereby the electric field is determined in terms of the incident power on the cavity and the standing-wave pattern on the input line. The procedures designated for high Q_L cavities are the cavity mode method which is applied when the field configuration can be readily computed and the tuning-rate method which is applicable when the cavity has a complicated shape. For cases where the cavity Q is very low, a 4-terminal network method is proposed which is subject to the restriction that the region of the discharge is small compared to λ. A discussion is given on converting incident-power measurements at frequencies other than the cavity resonant frequency to equivalent ones at resonance. (See also TIP U22085) (NRS abst.)

4083
Radiation Lab., Univ. of Calif.
POWER SUPPLY FOR NUCLEAR RESEARCH LABORATORIES, by Carl Grauer. Apr. 1952. 18p. (UCRL-1795)

The electrical power supply for a modern research laboratory is described. Emphasis is placed upon the versatility and safety of the equipment. Photographs are given showing equipment used at the Radiation Lab., Univ. of Calif.

4084
Radiation Lab., Univ. of Calif.
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 27, 1952, by S. Shewchuck. Apr. 14, 1952. 7p. (UCRL-1761)

The Triton Reaction ($p + d \rightarrow \pi^+ + t$). W. J. Frank. Preparations for investigating this reaction are discussed, including expected energy and angular distribution of the products, suppression of background by taking advantage of the different times of flight, and counting problems. Use of C^{14} in Humans. N. T. Berlin. About 85% of the activity of C^{14}- labeled glycine injected intravenously in humans was excreted as expired $C^{14}O_2$. Three rates of half time were found: 3, 31, and 223 hr; 40% of the expired activity was excreted the first day, and 92% was excreted in 40 days. Urinary excretion accounted for 13.4% of the total activity; 97% of the total was excreted in 100 days. A 50-day turnover component was found in addition to those predicted from animal data. Meson Exchange Contributions to the High-Energy Deuteron Photoeffect. R. H. Huddlestone. Abstract report UCRL-1713 (which will not be published) of a paper by this title (which will be published) is duplicated. It reports that an attempt has been made to estimate meson-exchange effects in the photodisintegration of the deuteron between 140 and 290 Mev on the basis of pseudoscalar meson theory with gradient coupling. The results for a value of $f^2/4\pi \approx 0.1$ are in approximate agreement with the mildly rising energy dependence of the observed total cross section, and the differential cross section is not inconsistent with experiment.

4085
Research Lab. of Electronics, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT, by A. G. Hill, J. B. Wiesner, and G. G. Harvey. Apr. 15, 1952. 93p. (NP-3775; U21836)

Progress is reported on studies of physical electronics, microwave gaseous discharges, solid state physics (theory, soft x-ray spectrograph, microwave study of Ge), low-temperature physics, microwave spectroscopy, and microwave tubes and magnetron development. Advances in molecular beam, magnet laboratory, communication, and analog computer research are also described. (cf. TIP U20665) (NRS abst.)

4086
North American Aviation, Inc.
TRANSIENT THERMAL STRESSES, by M. Heisler. Issued May 26, 1952. 33p. (NAA-SR-176)

The stresses induced in large plates or shells are determined for a number of heating or cooling processes. These include heating by (1) high frequency induction, (2) constant ambient temperature, (3) uniformly varying ambient temperature, and (4) internal heat sources. It is pointed out that the absolute magnitude of the stress for Case 1 is equal to that for Case 2, while the magnitude for Case 3 is equal to that for Case 4. It is also shown that the temperature and stress equations for Cases 3 and 4 can be obtained from a simple integration of Cases 1 and 2. A number of graphs are given so as to facilitate the numerical evaluation of the stresses. (auth)

4087
ELECTROLYSIS OF THORIUM OXIDE. W. E. Danforth. Phys. Rev. 86, 416(1952) May 1.

A current of 100 ma/cm^2 was passed at a temperature of 1300°C through optically clear specimens of cut, ground, and polished crystalline Th oxide. The changes in appearance of the Th oxide during passage of the current are described. A darkening of the crystal formed at the cathode end and proceeded toward the anode at ~1 mm/sec; a metallic deposit formed on the crystal surface at the cathode end and increased in area until it reached the anode, establishing a short circuit and causing electrolysis to cease. The passage of 0.35 coulomb resulted in electrolysis of $\sim 10^{-2}$ mg of Th.

4088
COEXISTENCE OF LIQUID HELIUM I AND II. Philip Closmann and Richard T. Swim. Phys. Rev. 86, 576-7 (1952) May 15.

A thermally isolated column of He was set up in such a way that one end could be at temperatures below the λ point while the other end could be above the critical point. The tube could be filled with He at more than the critical pressure, and the temperature at any place in it determined by a small resistance thermometer which could travel through the length of the tube. The results show that at pressures above 2.2 atmospheres and under equilibrium conditions, practically the whole of the tube was full of liquid He II, leaving only about 4 cm at the top of the tube for the temperature gradient between 2.16 and 80°K. The transition region between liquid He II and liquid He I as well as between liquid He I and the gas showed no phase boundary or any other anomalous optical properties. However, on re-

leasing the pressure slightly below the critical value, critical opalescence and subsequently the appearance of a meniscus was observed in this region. Prior to these observations when He was being introduced into the tube, it was noted that the evaporation of liquid from the pumped He II bath increased rapidly because the tube containing liquid He II and reaching up into the Dewar vessel constituted a very good heat conductor.

4089
HELIUM LIQUEFIER OF HIGH OUTPUT. L. Weil. J. phys. radium 13, 241-2(1952) Apr. (In French)

A He liquefier of the classic type, the He being cooled by the Joule-Thompson effect after preliminary coolings in liquid N_2 and boiling H_2, is described. Output is 2 liters/hr, 19% of the theoretical yield.

4090
BROWNIAN MOVEMENT OF RADIOACTIVE PARTICLES. Armin Teske. Roczniki Uniw. Marii Curie-Sklodowskiej (Lublin) 4AA, 1-46(1949). (In Polish)

In addition to the ordinary Brownian movement of a radioactive particle suspended in a gas or liquid, a similar statistical movement will occur because of recoil following particle emission. Investigation of this "radioactive" Brownian movement would provide a new approach to the statistical properties of radioactive substances and might provide experimental evidence for the existence of the neutrino. Equations for displacement of a radioactive particle are derived. Experimental possibilities with ultracentrifuges and suspended mirrors in very low gas pressures are discussed. A 17-page English summary presents all essential features of the discussion.

AEROSOLS

4091
Central Aerosol Labs., Columbia Univ.
PROGRESS REPORT NO. 6 COVERING PERIOD FROM FEBRUARY 28, 1951 TO MAY 31, 1951. INVESTIGATION OF PARTICLE SIZE BY DIFFERENTIAL SETTLING, by Joseph Benedict and FORWARD ANGLE SCATTERING CAMERA FOR THE STUDY OF SIZE-FREQUENCY DISTRIBUTION OF AEROSOL, by Pui-Kum Lee. [nd] 18p. (NP-3891; Progress Report No. 6; ATL-117053)

4092
PARTICLE SIZE DISTRIBUTION FROM SMALL-ANGLE X-RAY SCATTERING. Jacob Riseman. Acta Cryst. 5, 193-6(1952) Mar.

A solution of the integral equation describing the intensity of x-ray scattering at low angles by a non-uniform collection of independently scattering spherical particles is given. The final result is in a form such that the particle-size distribution can be calculated by integration. The resolvent kernel, which solves the integral equation, is shown to be a combination of half-integral order Bessel functions, and therefore obtainable from known tables. Utilizing the known scattering form for a single-sized group of spherical particles as illustration, the expected δ-function type of distribution is shown to result. The result obtained here can also be applied to the visible light scattering of dilute solutions of polydisperse macromolecules. (auth)

COSMIC RADIATION

4093
ANGULAR DISTRIBUTION AND EAST-WEST DISSYMMETRY OF COSMIC-RAY INTENSITY, DETERMINED BY MEANS OF NUCLEAR EMULSION. Max Morand and Tsai-Chü. Compt. rend. 234, 1875-7(1952) May 5. (In French)

Ilford G5 emulsions were exposed at Tammanrasset, Algeria (1400 m, 25° 30′ N geomagnetic latitude) for 53 days with the plane of the emulsion vertical and its face to the north. Only tracks with lengths of 100 μ or more with minimum ionization were counted. The distribution of 3273 tracks, with α being the angle between the vertical and the projection of a track on the plane of the emulsion, was $I = I_0 \cos^{\lambda}\alpha$, with $\lambda = 1.95 \pm 0.1$. For tracks with $\alpha < 15°$, a similar relation held for β, the angle between the track and the projection, with $\lambda = 6.26 \pm 0.3$. The total intensity, corrected to sea level, was $0.0243 \pm 0.0009/cm^2/sec$, and the east-west dissymmetry was 0.105 ± 0.035.

4094
AN INVESTIGATION, USING SCINTILLATION COUNTERS, OF 'DOUBLE STARS' DUE TO COSMIC RAYS. J. B. Harding. Nature 169, 747-8(1952) May 3.

Two KI(Tl) crystals were placed in optical contact with two multipliers. Bias settings corresponding to energy losses of 40 Mev were determined by comparison with pulses produced by 6.0- and 8.8-Mev α particles, obtained by contaminating the crystals with Pb^{212}, and extrapolating linearly. Variations of ±3 volts in the high tension voltage mean that events liberating 42 Mev with fluctuations of the order of 10% were detected. The observed rate of coincidences was compared with the rate of formation of double stars. It was found that the frequency of double stars detected by the crystals is much smaller than that estimated from emulsion results.

4095
THE HIGH LATITUDE NORTH-SOUTH ASYMMETRY OF COSMIC-RAYS. D. W. P. Burbury. Phys. Rev. 86, 577-8 (1952) May 15.

A sea-level north-south asymmetry has recently been observed at Hobart, Tasmania (geomagnetic latitude 51.7° south) for zenith angle 30° under 12 cm of lead, the excess being in the north. The value obtained is 0.0056 ± 0.0013 (probable error). The east-west asymmetry observed at the same zenith angle and lead thickness is 0.0113 ± 0.0043. The east-west asymmetry has been explained as a secondary-radiation effect (Johnson, Phys. Rev. 59, 11(1941)), and a similar explanation is suggested to account for the N-S asymmetry.

4096
SHOWER EFFECT IN THE ABSOLUTE MEASUREMENT OF THE INTENSITY OF COSMIC RADIATION. Georges Bonnevay. J. phys. radium 13, 68-73(1952) Feb. (In French)

The absolute vertical intensity I_0 of cosmic radiation was measured with a G-M telescope. The necessary correction for showers was found to be 6%. The corrected value for I_0 is given as 0.0120 ± 0.0004 particles/cm^2/sec/steradian for 760 mm Hg, the radiation being filtered through 2.4 g/cm^2 of brass.

4097
COMPOSITION AND TIME VARIATION OF PRIMARY COSMIC RADIATION. D. Lal, Yash Pal, M. F. Kaplon, and B. Peters. Phys. Rev. 86, 569-70(1952) May 15.

The flux of heavy primary nuclei at geomagnetic latitude $\lambda = 3°$ has been measured in nuclear emulsions exposed during balloon flights in the stratosphere. The flux values obtained in two separate flights are given by $I(\lambda = 3°) = 1.30 \pm 0.25$ particles/m^2/sec/steradian for $6 \leq Z \leq 10$, and $I(\lambda = 3°) = 0.30 \pm 0.07$ particles/m^2/sec/steradian for $Z > 10$. Haber-Schaim (Phys. Rev. 84, 1199(1951)) has deduced an integral energy spectrum proportional to $\epsilon^{-1.56}$ for the total primary radiation in the energy interval $10^{11} < \epsilon < 1.2 \times 10^{12}$ ev (ϵ is energy per nucleon). Support for this power law has been obtained from observations of Auger showers, protons, He nuclei, and heavy nuclei with $Z > 10$. It is concluded that the chemical composition of the primary beam is essentially constant not only in the latitude-sensitive region but even at much higher energies. The incident cosmic-ray energy

carried by various primary components is approximately distributed as follows: 66% due to protons; 26% due to He nuclei; 5% due to C, N, and O; 3% due to nuclei of $Z \geq 10$. This distribution has now been shown to be valid for the primaries which produce the bulk of cosmic radiation at sea level.

4098

THE PRIMARY COSMIC RADIATION AT HIGH LATITUDES. Martin A. Pomerantz and Gordon W. McClure. Phys. Rev. 86, 536-45(1952) May 15.

Various properties of the new group of low-energy primary cosmic-ray particles ($E < 1.6$ bev for protons) which enter the top of the atmosphere at geomagnetic latitudes north of 52° were investigated during the summer of 1950. Measurements at both 52°N (Swarthmore, Pennsylvania) and 69°N (Fort Churchill, Manitoba) were obtained with the same quadruple-coincidence counter trains used previously, oriented either horizontally or vertically, and with pulsed ionization chambers biased to detect bursts exceeding 1.0 Po-α. No diurnal or temporal variations in the cosmic-ray intensity were detected, and no change between 1949 and 1950 was indicated. Flights were conducted with counter trains containing various thicknesses of interposed Pb absorber. In contrast with the 46 percent increase in the vertical intensity between the two statious, no latitude effect was revealed either in the flux of cosmic rays traveling in the horizontal direction or in the frequency of bursts detected by the ionization chambers, at the highest altitudes attained (~9 mm Hg). The data permit conclusions to be drawn regarding the horizontal component, the solar dipole moment, the nature of the low-energy spectrum, as well as nuclear disintegrations and primary heavy nuclei. (auth)

4099

THE ASSOCIATION OF BURSTS AND PENETRATING SHOWERS. Donald E. Hudson. Phys. Rev. 86, 453-64 (1952) May 15.

Local cosmic-ray bursts and penetrating showers have been studied together using an arrangement of ionization chambers and shielded counters. The experiment investigated (1) the occurrence of penetrating showers associated with large bursts, and (2) the occurrence of bursts associated with large penetrating showers. Evidence is presented to show that the bursts are mainly locally generated large electronic cascades. Nearly 60 percent of bursts larger than 25 bev (about 250 electrons) contained observed penetrating component. The transition effect of penetrating and nonpenetrating bursts was in qualitative agreement with a nuclear cascade process. Bursts of a few hundred electrons contained on the average about 1 percent of penetrating particles. Essentially no penetrating showers of multiplicity over 14 were unaccompanied by fairly large electronic cascades. The consistent association of cascade bursts with penetrating showers and vice versa is in qualitative agreement with present neutral-meson concepts. The main experimental work was done at Echo Lake, Colorado (elev. 3260 m). (auth)

4100

ON THE NUCLEONIC COMPONENTS PRODUCING LARGE COSMIC-RAY BURSTS UNDER THICK SHIELD. Tadashi Kameda and Masami Wada. Progress Theoret. Phys. (Japan) 7, 1-13(1952) Jan.

By analyzing the size-frequency distributions of large cosmic-ray bursts obtained at three stations by SRI ion chambers, it is concluded that: (a) about 40% of the total bursts at sea level are those induced by nucleons and the portion of them decreases with increasing size, (b) absorption mean free path of burst-producing nucleons is 120 g/cm^2 in air, and decreases with increasing size, approaching to collision mean free path of air. Moreover, from the comparison of the results with others, it is shown that the absorption mean free path of burst-producing nucleons near sea level is not the same as that at high altitude, but it elongates near sea level. Some discussions on burst production are presented in connection with the results. (auth)

4101

CALCULATION OF THE EQUILIBRIUM AMOUNT OF β-ACTIVE CARBON IN THE ATMOSPHERE FROM DATA ON COSMIC NEUTRONS. G. Pfotzer. Z. Naturforsch. 7a, 145-9(1952) Feb. (In German)

Calculations of the absolute rate of C^{14} production by cosmic neutrons are discussed. The limits are 1.9 to 2.5 C^{14} atoms/sec in a column of air 1 cm^2 in cross section. From this the equilibrium amount of C^{14} over the entire earth's surface is 55 to 74 metric tons, corresponding to a specific activity for the carbon in organic-biological substances of 13.5 to 18 β particles/min/g. These limits are in good agreement with the directly measured value of 15.3 ± 0.1.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

4102

THE TEXTURE OF DIAMONDS USED FOR COUNTING α, β OR γ PARTICLES AS FOUND FROM DIVERGENT-BEAM X-RAY PHOTOGRAPHS. H. J. Grenville-Wells. Proc. Phys. Soc. (London) B65, 313-20(1952) May.

Since the radiation-counting efficiency of diamonds is a structure-sensitive property, x-ray experiments have been undertaken to see whether it is related to crystal texture. A technique for obtaining divergent beam photographs superimposed on Laue photographs has been developed, and results are given for 28 out of 38 colorless octahedral diamonds (edge 1 to 3 mm) whose ultra-violet transparencey, β-particle counting efficiency and fluorescence are known. The relative strength of the anomalous extra x-ray reflections generally found for comparatively perfect diamonds has also been determined for these 38 specimens. Counting efficiency does not seem to be closely related to texture and, in particular, mosaicity is not a necessary condition. (auth)

4103

NUCLEAR RESONANCE AND THE ELECTRONIC STRUCTURE OF TRANSITION METALS. W. D. Knight and C. Kittel. Phys. Rev. 86, 573(1952) May 15.

Consideration is given to Zener's suggestion (Phys. Rev. 81, 440(1951)) that the occurrence of body-centered-cubic crystal structures in the transition metals V, Cr, Nb, Mo, Ta, and W may be attributed to antiferromagnetic coupling between the 3d shells on adjacent atoms. Briefly summarized experimental evidence is rather against the possibility that all these metals have ordinary antiferromagnetism. If V had an antiferromagnetic array of the spins of the 3d electrons, then the nuclear-resonance spectrum would have a zero-field splitting of the order of 2×10^5 oersteds, caused by electron spin-nuclear spin interaction. The experimental results for V (and Nb) do not show any splitting within the experimental limits of about five oersteds. From these facts it is concluded that either the 3d bonding is completely covalent in V, or if the 3d shell is in a magnetic configuration, the direction of the total spin of each ion must change with a correlation time much less than 10^{-4} sec, corresponding to the observed nuclear-resonance line width.

ELECTRICAL DISCHARGE

4104

SPARK SPECTRA AT VERY HIGH TENSION IN THE AIR AND COLOR TEMPERATURES. Arlette Vassy, Harald Nörinder, and Étienne Vassy. Compt. rend. 234, 1957-9 (1952) May 12. (In French)

The spectra produced in air at atmospheric pressure by electric discharge between Cu electrodes separated by 17 to

155 cm, corresponding to voltages of 500,000 to 1,000,000 v, were studied with a quartz-prism spectrograph. Lines and bands of H, N, O, O III, O IV, N III, N IV, O_2^+, N_2^+, OH, NO, NO_2, and CO_2 were observed. Corresponding spectral temperatures were 15,000°K for 71-cm electrode separation; 16,000°K for 17, 30, and 155 cm; and 21,000°K for 50 cm.

4105
THE THEORY OF GASEOUS ARCS: I. THE FUNDAMENTAL RELATIONS FOR THE POSITIVE COLUMNS. K. S. W. Champion. Proc. Phys. Soc. (London) B65, 329-44 (1952) May.

It is postulated that the five fundamental relations, stated by Tonks and Langmuir to be sufficient to describe fully a low pressure positive column, also apply to high pressure positive columns. Previously, only two of these relations had been applied to high pressure columns. A 'natural arc radius' is postulated for low pressure arcs when the boundaries are removed an indefinite distance. Previous theories of low pressure arcs always assumed that the arc completely filled the cross section of its containing vessel, and thus did not apply to low pressure arcs in large chambers or arcs at intermediate pressures. The theory of low pressure arcs with high electron densities in which ionization by stages is important is developed. It is then shown that by taking recombination into account this theory may be applied to intermediate and high pressure arcs with a high degree of ionization. A first approximation is also obtained for the theory of high pressure arcs in which there is a low degree of ionization. All the theory presented includes the effect of a longitudinal magnetic field, and the no-field conditions are included as a special case. It is found that the effects of a magnetic field predicted by the theory are in agreement with experimental observations. (auth)

4106
THE THEORY OF GASEOUS ARCS: II. THE ENERGY BALANCE EQUATION FOR THE POSITIVE COLUMNS. K. S. W. Champion. Proc. Phys. Soc. (London) B65, 345-56(1952) May.

The theory of arcs is developed further by investigating the energy balance equation for high pressure positive columns. The energy balance equation put forward by Suits and based on the Nusselt relation is considered and some refinements in his analysis result in better agreement between theory and experiment. This theory only takes into account energy losses due to convection and conduction, but the neglect of radiation losses is justified for a wide range of conditions by reference to experimental values of radiation efficiencies. The effect of a longitudinal magnetic field on high pressure arcs is then investigated. From the point of view of the energy balance equation the action of a magnetic field is to reduce the contributions of the charged particles to the conduction and convection losses from the column. Horizontal and vertical arcs are considered separately, as the nature of the convection, and hence the effect of a magnetic field, is not the same in the two cases. The theory predicts that the action of a magnetic field will tend to a limit with sufficiently strong fields, and certain simple relations are deduced which should apply in this case. According to the theory, when the radius of a high pressure arc is reduced by a magnetic field the arc temperature must rise (incidentally, only by a relatively small amount) and the positive column gradient may increase or decrease, depending on certain relations which are specified. There are virtually no experimental data available for these conditions, but the scant data available are in general agreement with the theory. (auth)

4107
ARCING AT ELECTRICAL CONTACTS ON CLOSURE. PART III. DEVELOPMENT OF AN ARC. L. H. Germer. and J. L. Smith. J. Applied Phys. 23, 553-62(1952) May.

A description is given of a system made up of experimental electrodes and an oscilloscope by means of which the potential across the electrodes can be recorded with a time resolution of about 10^{-9} sec and a potential sensitivity of 1-trace width per volt. The closure of the electrodes to produce a short arc is synchronized with the oscilloscope sweep so that the beginning of the arc is photographed. As an arc starts the potential across the electrodes decreases more or less gradually from the applied voltage to a steady value characteristic of the metal of the electrodes. The course of this change is extremely variable as is also the time over which the change is spread. The average value of the time appears to vary with circuit inductance and with the nature of the electrode surfaces. For inactive silver surfaces and an inductance of 0.10 μh the average value of the time is about 0.007 μsec, and for active surfaces and the same inductance 0.011 μsec. For active surfaces and an inductance of 5 μh the average value of the time is 0.02 μsec. The electrode separation at which an arc strikes is determined from the oscilloscope traces and from a correction for the height of the mound of metal thrown up by the arc. For active silver electrodes the average separation (at 40 or 45 volts) corresponds to a gross electric field of 0.8×10^6 volts/cm, and for inactive silver electrodes to a field of 2.3×10^6 volts/cm. These are probably better values than earlier measurements of these fields. There has not yet been any success in interpreting these phenomena in terms of fundamental processes. (auth)

4108
OBSERVATIONS ON RADIO-FREQUENCY OSCILLATIONS IN LOW-PRESSURE ELECTRICAL DISCHARGES. N. R. Labrum and E. K. Bigg. Proc. Phys. Soc. (London) B65, 356-68(1952) May.

The generation of high-frequency energy by electrical discharges in air at low pressures has been investigated by observations with several types of discharge tube, at frequencies near 200 Mc and below 2 Mc. Random noise of high intensity was observed in both these frequency ranges, and was found to be associated with a field reversal in the discharge. Coherent oscillations were also observed at the lower frequencies, and there was evidence that these were the cause of the striations of the positive column. (auth)

ELECTRONS

4109
A NEW CLASSICAL THEORY OF ELECTRONS. II. P. A. M. Dirac. Proc. Roy. Soc. (London) A212, 330-9(1952) May 7.

An analysis is made of the motion of a stream of electrons obeying Lorentz's equations of motion. It leads to a more general action principle than that of an earlier paper, containing two new field variables. The present theory allows vorticity in the electron stream, while still involving e and m only in the ratio e/m. A hamiltonian formulation of the equations is deduced. (auth)

4110
TRAJECTORIES IN ELECTRONIC LENSES; AN APPROXIMATION METHOD. F. Bertein. J. phys. radium 13, 41A-49A(1952) Feb. Suppl. (In French)

A method of successive approximations is given for integrating the differential equations of electron optics. For simple fields, the method furnishes the trajectories with ease and sufficient precision and in an analytic form lending itself to the functional study of various parameters. Higher approximations are obtained with no other difficulty than those offered by the resolution of a system of algebraic linear equations.

GASES

4111

Research Lab. of Electronics, Mass. Inst. of Tech.

METHODS OF MEASURING THE PROPERTIES OF IONIZED GASES AT HIGH FREQUENCIES. I. MEASUREMENTS OF Q, by Sanborn C. Brown and David J. Rose. Jan. 22, 1952. 18p. (NP-3815; Technical Report No. 222; U22085)

Experimental methods for obtaining the Q of both high- and low-Q resonant cavities were investigated in connection with determining the practical measurements necessary in establishing the properties of ionized gases at microwave frequencies. The lumped circuit representation of a cavity was introduced. The system under analysis consisted of a cavity and part of the input line to which the cavity is coupled by loops through vacuum-tight, glass seals. The calculations apply explicitly to the usual case in which the cavity terminates the line. Relationships were derived for determining the impedance, the Q, and the resonant wave length of the cavity system from measurements of the voltage distribution on the line terminated by the cavity. The measurements involve determining the position of the voltage minima and the ratio of maximum to minimum voltage on the line in db as functions of λ. Three Q-measuring procedures using the relationships derived are outlined: a resonance-curve method, a phase-curve method, and a technique employing an HF impedance bridge. The effect of introducing a steady-state discharge into the cavity is also considered. (See also TIP U22070) (NRS abst.)

4112

Knolls Atomic Power Lab.

DIFFUSION OF HELIUM AND XENON THROUGH POLYMERS, by F. J. Norton. Apr. 22, 1952. 15p. (KAPL-737)

Using the mass spectrometer, the permeation velocities of helium and xenon were measured through perbunan, butyl rubber, neoprene, and natural rubber at 25°C. Perbunan is the most impermeable of these materials. For xenon, the permeation velocity through perbunan is lower, by a factor of 60, than through natural rubber. (auth)

4113

Iowa State Univ.

THE FLOW OF GASES THROUGH PLASTIC MEMBRANES, by David William Brubaker and Karl Kammermeyer. May 2, 1952. 31p. (AECU-2061)

This investigation was undertaken to obtain quantitative data on the rates of gas transmission through a number of polymeric films and to interpret the data in terms of the thickness, the molecular weight, the type of film and also the effect of gas pressure and of temperature. 56 polymeric membranes were investigated and their compositions tabulated. The gases used were He, H, CO_2, O, and N.

4114

National Bureau of Standards

HIGH TEMPERATURE THERMODYNAMICS TECHNICAL REPORT. Aug. 20, 1951. 348p. (NBS-1123; U19179)

Summaries are presented of the following research programs: determinations of gas tempreatures by radiation methods; studies of relative intensities in the ultraviolet and visible spectra from flames; development work on the noise thermometer; measurements of heat capacities and thermal conductivities at high temperatures; and work in pyrometry. The appendixes contain abstracts of 5 papers presented before the Am. Phys. Soc.; reports on the theoretical analyses of infrared spectra, the tube furnace for spectroscopic observations of hot gases in thermal equilibrium, rotational temperatures of OH in CH_4-air flames, and kinetics of OH radicals in flames; and reprints of papers on the heat capacity of Na between 0 and 900°C, calorimetric properties of diphenylether from 0 to 570°K, and heat capacity of liquid Hg between 0 and 450°C. (NRS abst.)

4115

PLUG TRANSFER BETWEEN TWO PHASES KEPT AT CONSTANT PRESSURES. R. O. Davies. Physica 18, 270-4(1952) Apr. (In English)

The usual thermodynamic discussion of the Joule-Kelvin effect is incomplete because it assumes the existence of a stationary state with fixed Δp. Such a stationary state is not possible for an adiabatically isolated system with non-zero heat of transfer. Then a "pseudo stationary state" can be set up in which ΔT remains constant (for fixed Δp) while the temperatures of the cylinders vary in time. The relation $\Delta T/\Delta p = -M^*vT$ is then analogous to the thermomechanical formula $\Delta p/\Delta T = -Q^*vT$. For Knudsen transfer through a small aperture, $M^* = -2(\text{at. wt.})/9RT$. (auth)

4116

ON THE LIQUID-VAPOR COEXISTENCE CURVE OF XENON IN THE REGION OF THE CRITICAL TEMPERATURE. M. A. Weinberger and W. G. Schneider. Can. J. Chem. 30, 422-37(1952) May.

The liquid-vapor coexistence curves of very pure Xe have been determined in bombs of vertical lengths 1.2 cm and 19 cm. The longer bomb yielded a flat-topped coexistence curve, the shorter a more rounded curve. The classical van der Waals theory is capable of explaining a large portion of the flat top if effects of gravity are taken into account. Details of the theoretical variation of the width of the flat top with vertical bomb lengths are given. The critical data obtained for Xe are $\rho_c = 1.105$ g/cc, $T_c = 16.590 \pm 0.001$°C. The danger of contamination of gases in the critical region on contact with gasket or packing materials is stressed. (auth)

4117

DIFFUSION IN GASES. III. RELATION BETWEEN SELF-DIFFUSION AND VISCOSITY. DIFFUSION IN NOBLE GASES AND HYDROGEN. Leonid Andrussow. Z. physik. Chem. 199, 314-29(1952) Apr. (In German)

Calculated self-diffusion coefficients of 35 gases, not including D_2, and coefficients of their diffusion in each other are tabulated and compared with experimental data. The anomalous behavior of H_2 is discussed.

4118

VISCOSITY AND DIFFUSION IN THE GAS PHASE. IV. CALCULATION OF THE VISCOSITY OF PURE GASES AND THEIR MIXTURES. TEMPERATURE COEFFICIENT OF VISCOSITY. Leonid Andrussow. Z. physik. Chem. 199, 330-44(1952) Apr. (In German)

A simple expression is derived from which the viscosity of gas mixtures can be calculated. Necessary data for 32 constituent gases are tabulated. The so-called viscosity number and determination of temperature coefficients are explained.

INSTRUMENTS

4119

Wisconsin Univ.

DOUBLE CRYSTAL AND SLIT METHODS IN SMALL ANGLE X-RAY SCATTERING, by Harold Ritland, Paul Kaesberg, and W. W. Beeman. [nd] 10p. (NP-3767; U9920)

4120

Pennsylvania State Coll.

APPLICATION OF HIGH FREQUENCY OSCILLATORS. I. CIRCUIT AND ARRANGEMENT FOR MEASURING REACTION RATES, by Donald G. Flom and Philip J. Elving. Dec. 10, 1951. 29p. (NP-3794; Technical Report No.11; U21904)

The circuit of a tuned-plate, tuned-grid HF (15-20 megacycles) oscillator described by Jensen and Parrack (Ind. Eng. Chem., Anal. Ed. 18, 595(1946)) was modified to provide a simple and efficient means of following changes in

concentration. Grounding the power pack and oscillator amplifier unit on a Cu sheet, use of numerous mica bypass condensers, and an added resistor improved sensitivity and stability. A Hewlett-Packard 712A power supply connected to a 110-v, 60-cycle line through a Sola constant-voltage transformer permitted more than 0.5% regulation and less than 12 mv ripple; voltage supply was not critical between 200 and 400 v. A 6C5 vacuum tube in the balancing circuit reduced noise. The substitution of CCl_4 for H_2O as the circulating fluid necessitated construction of a constant-temperature system which included only glass-to-glass, glass-to-metal, and metal-to-metal joints. Current output was recorded on a Brown Electronik Recorder. Acid-base titrations and determination of concentration-current relationships indicated that (1) electrolytes loaded the oscillator much more than nonelectrolytes, and (2) very dilute solutions could be titrated. (NRS abst.)

4121

Research Foundation, Ohio State Univ.

ON THE PREPARATION OF MAGNESIUM TARGETS FROM MgO, by Leonard N. Russell, Warren E. Taylor and John N. Cooper. [nd] 3p. (AECU-2051)

Efforts were made to discover a suitable technique of preparing thin Mg targets from MgO. Reduction of MgO in vacuum, and evaporation of the reduced metal, was unsatisfactory. The heating of MgO to incandescence on a Ta strip led to good coatings of Mg, but heating on W, graphite, and Pt was unsatisfactory. The technique that led to the best Mg targets involved spreading a thin layer of MgO uniformly over the central ½ in. of a 0.0015-in. Ta strip about 0.75 in. long and 0.5 in. wide. The two ends of the strip are spot-welded to electrical contacts. About 2 in. above the Ta is placed the target array to be plated on a backing kept cooled to well below the melting point of Mg. The Ta is heated by passing a current of about 30 amp through it. The target is roughly 10 kev thick for 1 Mev protons.

4122

Los Alamos Scientific Lab.

EFFECT OF AMBIENT CONDITIONS ON THE PERFORMANCE OF AN AINSWORTH MICROBALANCE, by James T. Waber and Gladys E. Sturdy. May 1952. 11p. (LA-1382)

Standard deviation values have been obtained from a statistical study of the performance of an Ainsworth microbalance. These values are in good agreement with those obtained by other investigators and approach the practical lower limit for deviation. No significant correlation could be made between the variation of weight of an object with elapsed time or with variations of ambient temperature or humidity. (auth)

4123

Argonne National Lab.

SATURATION PROPERTIES OF URANIUM FISSION CHAMBERS, by A. C. Lapsley. Mar. 31, 1952. 27p. (ANL-4806)

Experiments with cylindrical chambers activated by fission fragments showed that the voltage required for saturation depended on the polarity with which the potential was applied. Calculations were performed to determine what the collection voltages should be, and they were in good qualitative agreement with the experimental data. The indicated results were that the voltage required for saturation will depend to a large extent on how the ionization varies with respect to the chamber coordinates. Normally, more voltage is required when the central electrode is negative. Three specific cases of ionization distribution have been treated. These are (1) fission fragments entering from outer wall of chamber, (2) fission fragments entering from inner wall of chamber, and (3) ionization density independent of coordinates. (auth)

4124

THE CONSTRUCTION AND TESTING OF A MAGNETIC PRISM β-SPECTROGRAPH OF HIGH RESOLUTION, WITH A NOTE ON THE REPORTED FINE-STRUCTURE OF CERTAIN INTERNAL CONVERSION LINES OF RaC – C′ [Bi^{214} – Po^{214}]. R. E. Siday and D. A. Silverston. Proc. Phys. Soc. (London) A65, 328-44(1952) May 1.

The first setup of a very simple high resolution β-spectrograph is described. The instrument employs the focusing action of a magnetic prism with circular plane poles of 20 cm diameter. For this area of pole surface the dispersion is large, giving advantage to the width of source that may be used; and the instrument can focus electrons with energies up to 4 Mev. It has been used with resolving powers $H\rho/\Delta H\rho$ up to 1300 as measured from microphotometer traces on the plates. It appears to be the only instrument that has been operated at these resolutions as a spectrograph. As a β-spectrometer, the resolving power should be 15% higher, but this has not yet been tested. As far as can be seen it has a luminosity roughly comparable with that of the ketron, but unlike that instrument it has considerable flexibility of experimental arrangement promising improved performance. It has been used to look for the fine structure of the K-conversion line corresponding to the 1414-kev γ transition in the disintegration RaC – C′ (Bi^{214} – Po^{214}) reported by Latyshev and others. In agreement with the work of Bashilov and others who employed the ketron, and of Serebriskaya, Shpinel and Forafontov who used a spectrometer of completely novel design, this line was found to be highly monokinetic. (auth)

4125

CIRCULAR SWEEP CHRONOGRAPH FOR SINGLE MILLISECOND TIME INTERVALS. Arthur Linz, Jr. Rev. Sci. Instruments 23, 199-203(1952) May.

A chronograph is described which measures single time intervals up to 1000 microseconds with an accuracy of ±10 millimicroseconds. The instrument consists of a 100-kc counter chronograph with a 10-microsecond circular sweep to interpolate between scaler readings. Suitable pulse sharpening circuits and a five tube, high speed gate circuit in which the pulses defining the timing interval form the edges of the gate are also described. The possibility of extending the precision of the time measurement to ±1 millimicrosecond is indicated. (auth)

4126

NON-LINEAR AMPLIFICATION IN E.M.I. [RESEARCH LAB TYPE] PHOTOMULTIPLIERS. J. F. Raffle and E. J. Robbins. Proc. Phys. Soc. (London) B65, 320-4(1952) May.

The output pulse heights obtained from E.M.I. Research Lab Type photomultipliers are found not always to be proportional to the quantity of light incident of the photo-surface of the photomultiplier. The photomultiplier ceases to be a linear amplifier of the incident light pulses when the charge density in the multiplier becomes too great. The relation between pulse height and energy loss of alpha-particles in various fluorescent materials has been determined at low values of charge density. (auth)

4127

PULSE ANALYZER WITH TEN CHANNELS. Michel Langevin and Gilbert Allard. Compt. rend 234, 515-18 (1952) Jan. 28. (In French)

A pulse-amplitude analyzer circuit with 10 channels of equal width is sketched. A more legible circuit diagram is given in J. phys. radium, 20S(1952) Apr.

4128

LEAK LOCALIZER FOR VAN DE GRAAFF ACCELERATOR TUBES. F. H. Kloepper, L. W. Seagondollar, and R. K. Smith. Rev. Sci. Instruments 23, 245(1952) May.

This laboratory has developed a device which allows one to find leaks in accelerating tubes by applying gas pressure to selected small portions of the exterior of the accelerating tube. Application of this device to successive small portions of the tube allows one to localize the leak to within less than one-inch length of the tube.

4129
THE USE OF A PULSE-HEIGHT-ANALYZER FOR TIME INTERVAL MEASUREMENTS. G. Jenssen and A. Sunde. Physica 18, 265-9(1952) Apr. (In English)

A circuit to convert a pulse-height analyzer with channel widths of 5, 10, or 50 μsec to a time-interval analyzer is sketched.

4130
A NEW MATHEMATICAL MODEL OF THE ELECTRON LENS. Pierre Grivet. J. phys. radium 13, 1A-9A(1952) Feb. Suppl. (In French)

Optical properties of a lens having a characteristic axial function of the form $T(z) = T_0 \operatorname{sech}(z/b)$ are calculated. The description of the electronic radii and the cardinal elements makes use of Legendre functions of low, but not integral, index ν; various approximate expressions are given. The results are applied to the symmetric magnetic lens with success. A simple calculation of the axial field as function of the pole-piece dimensions is given, the permeability of iron being supposed infinite.

ISOTOPES

4131
Oak Ridge National Lab., Y-12 Area
ELECTROMAGNETICALLY ENRICHED ISOTOPES, INVENTORY, APRIL 30, 1952, by C. P. Keim, C. E. Normand, and Boyd Weaver. Apr. 30, 1952. 71p. (ORNL-1284)

This inventory lists the isotopes which have been concentrated electromagnetically, along with the completed information on their enriched abundances, and the element weights and product forms available in milligram quantities to users on Atomic Energy Commission projects and in university and industrial laboratories. (auth)

MASS SPECTROGRAPHY

4132
Argonne National Lab.
A VACUUM LOCK FOR ROUTINE SOLID ANALYSES WITH A MASS SPECTROMETER, by Charles M. Stevens. Dec. 1951. 13p. (ANL-4816)

This report was issued as AECU-1996 and abstracted in Nuclear Science Abstracts as NSA 6-3630.

4133
OPTIMUM GEOMETRICAL CONDITIONS FOR MASS SPECTROMETERS. Claude Geoffrion. Rev. Sci. Instruments 23, 224-28(1952) May.

The relations between slit dimensions, beam divergence, luminosity, and resolving power of various single-focusing mass spectrometers are established. From these, the conditions for maximum luminosity for a given resolving power are derived. It is found that a third-order spectrometer operated under optimum conditions can be more luminous than one of conventional design. Data are given. (auth)

4134
A LABORATORY MASS SPECTROMETER WITH MULTIPLE USES. Georges Philbert. J. phys. radium 13, 50A-58A (1952) Feb. Suppl. (In French)

The mass spectrometer described is characterized essentially by the use of relatively high gas pressure (10^{-2} mm Hg) in the ionization region, the possibility of modifying and exchanging the ion source, and the special facilities for ion-optics studies. Circuits are shown. 17 references.

4135
ABERRATIONS IN MASS SPECTROMETERS AS A CONSEQUENCE OF SPACE CHARGE AND MAGNETIC FIELD SATURATION. E. W. Becker and W. Walcher. Z. Physik 161, 395-407(1952). (In German)

The following were investigated experimentally in a 60° mass spectrometer with magnetic focusing: (1) the effect of space charge on position of the slit image and on the measured value of the ionic mass ratio; (2) the effect of magnetic field saturation on the focusing properties of the sector fields. Methods for eliminating aberration are discussed, and formulas for estimating the space-charge effect are derived.

4136
COLLISION DISSOCIATION OF IONS IN MASS SPECTROGRAPHS. Arnim Henglein. Z. Naturforsch. 7a, 165-71 (1952) Feb. (In German)

Dissociation of ions by collision with gas molecules can be conveniently investigated with a parabolic spectrograph. The ion fragments are detected by photographic film, on which they are characterized by position. Singly and doubly charged ion traces of hydrocarbon fragments are shown.

4137
A COMPARISON OF THE MASS SPECTRA OF SINGLY AND DOUBLY CHARGED IONS OF HYDROCARBONS. Arnim Henglein. Z. Naturforsch. 7a, 297-9(1952) Mar.-Apr. (In German)

The formation of molecular ions by ionization and breaking of the C–H bond are discussed. Graphs of mass-spectrographic intensity vs. number of H atoms for singly and doubly charged ions of the C_3 series from propane and of the C_2 series from n-butane are shown.

MATHEMATICS

4138
National Bureau of Standards
PENETRATION AND DIFFUSION OF X-RAYS; MATHEMATICAL TECHNIQUES, by L. V. Spencer. Mar. 4, 1952. 17p. (NBS-1442)

A distribution function $\underline{G}(\underline{x})$ is approximated by a sum of terms $G(x) = a_1 f(x,\beta_1) + a_2 f(x,\beta_2) + \ldots + a_n f(x,\beta_n)$, where the first $2\underline{n}$ moments of the approximate function agree with the corresponding moments of $\underline{G}(\underline{x})$, and the function $\underline{f}(\underline{x},\beta_i)$ may be one of a broad class of functions. The gauss method for evaluating integrals is discussed, and a method of approximating $\underline{G}(\underline{x})$ by a sum of Dirac delta functions is described. The method is generalized to include other than Dirac delta functions, and a numerical example is given. Methods are described for obtaining approximate functions from information other than moments. The approximate method is applied to the x-ray scattering problem. Tables of approximate functions are given.

4139
Los Alamos Scientific Lab.
A PROPERTY OF RANDOMNESS OF AN ARITHMETICAL FUNCTION, by N. Metropolis and S. Ulam. [nd] 3p. (AECU-2038; LADC-1177)

A random function f(x) is defined on a set E with values in E, i.e., for each $\underline{x}$ value $y = f(x)$ was chosen from E. E can be decomposed into minimal invariant subsets or "trees" by considering for each point $\underline{x}$ the smallest set X with the following properties: (1) $x \in X$, (2) if $y \in X$ then $f(y) \in X$, (3) if $\underline{y} < X$ all the points $\underline{x}$ such that $f(x) = y$ also belong to X. $E = X_1 + \ldots + X_i + \ldots$ will decompose into disjointed trees X_i. The number of trees expected in the decomposition given by $\underline{f}$ was investigated for a specific random function defined as follows: $\underline{x}$ is an integer ranging from 0 to 2^{k-1} written in the binary development $x = a_0 2^0 + \ldots a_i 2^i +$

... $a_{k-1}2^{k-1}$, x^2 is written again in the binary notation and f(x) is the number given by the middle k (out of 2k) digits of x^2. Then f(x), for k = 12, is 7. The distribution of the λ_i for some specific functions is close to that expected for a random transform. The values of f(x) for k = 12(n = 4096) and for k = 16(n = 65,536) are given. The only sizable deviations would occur for the set $f^{-1}(0)$ and $f^{-1}(2^{k/2})$.

4140

[Oak Ridge National Lab.]

A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART I, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] June 14, 1951. 22p. (AECU-2046)

Monte Carlo processes have been designed for estimating the solutions $\phi(x)$ of integral equations of the type $\phi(x) = g(x) + \lambda\int_R K(x,y)\,\phi(y)dy$ and of estimating functionals $I = \int_R \phi(x)\,\psi(x)dx$ by the general theory of stochastic processes involving an integral-valued parameter.

4141

[Oak Ridge National Lab.]

A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART II, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] Oct. 4, 1951. 19p. (AECU-2047)

This paper continues the author's preliminary studies of the general theory of the stochastic estimation of solutions and functionals of solutions of certain types of Fredholm integral equations. Additional tricks of estimations closely associated with those discussed in Part I are described, and the use of representative sampling for chain lengths is introduced as a definite procedure for reducing the variance when repeated estimates of any of the types discussed are to be averaged.

4142

[Oak Ridge National Lab.]

A GENERAL APPROACH TO THE MONTE CARLO ESTIMATION OF THE SOLUTIONS OF CERTAIN FREDHOLM INTEGRAL EQUATIONS; PART III, by G. E. Albert. [Oak Ridge National Lab. and Univ. of Tenn.] Jan. 2, 1952. 26p. (AECU-2048)

This paper continues the work of Parts I and II on the stochastic estimation of solutions and functionals of certain types of Fredholm integral equations. A stochastic process that allows repeated sampling for individual terms $I_N(x)$ of the Neumann series is introduced and combined with the general process of representative sampling for chain lengths. Representative sampling for chain points in estimating a single definite integral is discussed and applied to a special process. Finally, some miscellaneous remarks are made on extensions of the described procedures and on some theoretical points omitted from earlier discussion.

MEASURING INSTRUMENTS AND TECHNIQUES

4143

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 20, 1952, by S. Shewchuck. Apr. 11, 1952. 6p. (UCRL-1760)

I. π^- Mesons from C by 340-Mev Protons at 0° to the Beam. W. Dudziak. The talk was based on work for which an abstract report UCRL-1595 (NSA 6-974), entitled Measurement of the Production Cross Section of Negative Mesons in Carbon by 341 Mev Protons, has been published. II. Time of Flight Requirements for the Suppression of Background in Scintillation Counting Experiments with Pulsed Beams from High Energy Particle Accelerators. R. Madey and W. J. Frank. A scintillation-counter velocity selector is described to suppress background in experiments with pulsed beams from high-energy particle accelerators. A limiting factor on the performance of the selector is the time that elapses between response of the counter to successive pulses. A transmission-line-type pulse-duration limiter minimizes this factor. A high-impedance cable is used to limit the pulses to less than 5×10^{-9} sec. A pulse amplitude limiter feature is used as a grid cutoff characteristic in the vacuum tube. A circuit is provided for adding 2 short pulses from 2 photomultipliers. The conditions that must be met, in order to discriminate against the large background at the synchrotron by counting π-p coincidences at a time after an r-f beam pulse when the electron background has subsided, are discussed.

4144

Radiation Lab., Univ. of Calif.

SCINTILLATING CRYSTAL GAMMA COUNTER (thesis), by Kenneth Durl Jenkins. May 1952. 37p. (UCRL-1766)

A description is given of a simple counter which makes maximum use of existing commercial equipment and will count gamma rays down to ten kilovolts with no appreciable electrical or thermal noise being introduced. The counter has good stability and its gain can be made to stay constant indefinitely. (auth)

4145

Mound Lab.

REPORT FOR GENERAL RESEARCH OCTOBER 29, 1951 TO JANUARY 28, 1952 (Supporting Research Volume). Mar. 3, 1952. 25p. (MLM-658)

Plastic Film Absorbers. J. S. Stanton. Brief report is made of the preparation of thin Formvar-E plastic films coated with Al or Ag. Counting Systems for Pulses of Wide Dynamic Range. W. H. Baker. The reduction of the midband gain by the use of over-all negative feedback to approximately 1000 has extended the frequency response of the high-gain, wide-dynamic-range amplifier to beyond six megacycles. More constant values for the resolving time of this amplifier should be obtained by pulse-shaping within the gain loop. Criteria have been established for the counting rates of samples to be used for a determination of resolving time. The Development of a Method for the Continuous Monitoring of α-Contaminated Air. E. A. Reiter. The large-area scintillation monitor for α contamination of laboratory air (MLM-630) appears to be satisfactory but its discrimination against γ radiation is not very high. Calibration of the Standard, Low-Geometry Chamber. M. L. Curtis. The standard, low-geometry α chamber has been calibrated geometrically with an estimated precision of ±0.07 to ±0.18%. By counting numerous samples on several geometries, it was determined that the mean deviation from any one position to any of the others does not exceed 0.14%. A Single-Operation α Counter for Plated Samples. J. F. Combs. A chamber which will permit the counting of plated α samples in a single operation is described. Viscosimeter Timer. A. J. Rogers. Design considerations are presented for an instrument to measure the time of fall of a radioactive plummet through a fixed distance in a solution as a means of measuring the viscosity of the solution.

4146

Mound Lab.

A LOW-DENSITY PROPORTIONAL COUNTING GAS (Information Report), by E. H. Daggett. Feb. 20, 1952. 11p. (MLM-688)

H and He were used as the base gas for a study of low density proportional counting gases. Various amounts of isobutane, carbon dioxide, and methane were used as the quenching gas. Graphic representations of the results show that a 2% isobutane – 98% He mixture is a good comparison between density and counting characteristics.

4147
INFLUENCE OF VARIOUS FACTORS ON FADING OF THE LATENT IMAGE DUE TO IONIZING PARTICLES. Jacques Thouvenin and Pierre Demers. Compt. rend. 234, 1968-9 (1952) May 12. (In French)

Effects of grain diameter, humidity, I/(I + Br) ratio, presence of O_2, and time on the fading of the latent image produced by α particles of various energies in simple photographic emulsions have been investigated.

4148
SCINTILLATION COUNTER AS GAMMA RAY SPECTROMETER. V. O. Eriksen, G. Jenssen, and A. Sunde. Physica 18, 91-100(1952) Feb. (cf. NSA 6-2145)

The apparatus for γ-ray spectroscopy by means of a scintillation counter is described. The linearity between released photons and absorbed energy in NaI(Tl) for γ rays in the region 0.05 to 0.5 Mev is verified. The γ-ray energy of Ru^{103} has been measured and found to be 0.52 Mev. Differential discriminator runs and photographs of pulse distribution on an oscilloscope screen are shown. (auth)

4149
GRAIN DENSITY IN TRACKS OF ELECTRONS MOVING AT RELATIVISTIC VELOCITIES IN PHOTOGRAPHIC EMULSIONS. A. H. Morrish. Phil. Mag. 43, 533-7(1952) May.

The variation in the grain density of tracks produced in photographic plates by electrons moving at relativistic velocities has been determined. It is found that the grain density increases by about 5% between the energies 9 and 25, measured in rest mass units, thereafter remaining constant at least up to $E/mc^2 \sim 10^4$. (auth)

4150
USE OF PHOTOGRAPHIC EMULSIONS IN THE STUDY OF RADIOACTIVITY OF SOLUTIONS. Marie Ader. J. phys. radium 13, 110-11(1952) Feb. (In French)

The technique of cylindrical emulsions is applied by the author in the following manner: capillary tubes of K-free glass containing the radioactive solution to be studied are placed on a glass plate and covered with liquid emulsion. Traces of α and β particles of C^{14}, Po, and Th observed by this method are illustrated and discussed. The method is of particular interest in the study of very weak or long-lived radioactivities.

4151
THEORY OF THE RESPONSE OF ORGANIC SCINTILLATION CRYSTALS TO SHORT-RANGE PARTICLES. J. B. Birks. Phys. Rev. 86, 569(1952) May 15.

A general exciton theory has been formulated previously (Birks, Phys. Rev. 84, 364(1951)) to account for the dependence of the specific fluorescence dS/dr of an organic crystal on the specific energy loss dE/dr of the exciting particle. Taylor et al. (Phys. Rev. 84, 1034(1951)) observed that the specific fluorescence of anthracene excited by electrons of energy < 20 kev falls below the general smooth curve of dS/dr vs. dE/dr. Very similar behavior has been observed by King and Birks (Phys. Rev. 86, 568(1952)) when organic crystals were excited by short-range α particles. The purpose of the present paper is to extend the exciton theory to account for the behavior of excitons produced near the crystal surface; a factor ϕ, which is a function of distance of exciton origination from the crystal surface, is introduced into the equation for dS/dr. The new curve is in fair agreement with experimental values.

4152
SCINTILLATION RESPONSE OF ORGANIC CRYSTALS TO LOW ENERGY α-PARTICLES. J. W. King and J. B. Birks. Phys. Rev. 86, 568-9(1952) May 15.

The scintillation response of single flat crystals of anthracene, stilbene, and terphenyl to low-energy α particles have been studied with a collimated Po^{210} source and a 14-stage photomultiplier tube. The mean pulse size S, derived from the integral pulse distribution, was measured as a function of the mean residual air range r of the α particles incident on the crystal. It was found that for $r > \sim 8$ mm S increases linearly with r, but for $r < \sim 8$ mm the response S varies nonlinearly with r. According to the exciton theory of Birks (Phys. Rev. 84, 364(1951)), dS/dr is practically constant and independent of the specific energy loss dE/dr of the exciting particle. The experimental results show, however, that for $r < \sim 8$ mm, the value of dS/dr is less than that given theoretically. The ratio ϕ of the experimental value of dS/dr to the theoretical value is plotted against r. As r decreases from ~8 mm to zero, ϕ decreases from unity to 0.5.

4153
GEIGER-MUELLER MINIATURE COUNTING TUBE. W. Dreblow and W. Stremme. Z. Naturforsch. 7b, 161-3 (1952) Mar. (In German)

Construction of miniature G-M tubes of 3- to 5-mm diameter designed for insertion in body cavities is described. Technical data, useful life, and storage properties are given.

4154
A PROPORTIONAL COUNTER FOR NEUTRON FLUX MEASUREMENTS IN THE ENERGY RANGE 0.1 TO 1 MEV. T. H. R. Skyrme, P. R. Tunnicliffe, and A. G. Ward. Rev. Sci. Instruments 23, 204-9(1952) May.

A proportional counter, filled with hydrogen or methane, has been developed for the measurement of monoenergetic neutron fluxes in the energy range 0.1 to 1.0 Mev. The pulse distributions obtained from the recoil protons are in good agreement with the calculated distributions allowing for end and wall effects over this energy range for appropriate fillings. Flux measurements can be made with certainty to better than 5 percent. Calculations of wall and end effects have been repeated using the latest range-energy relation for protons. (auth)

4155
MEASUREMENT OF NEUTRON DENSITY BY AUTORADIOGRAPHY OF DETECTORS. André Ertaud and Pierre Zaleski. Compt. rend. 234, 1969-71(1952) May 12. (In French)

Thin foils of Au, Ag, Mn, or other detectors are inserted in the neutron flux to be measured, then placed against fine-grain photographic film. Darkening by the resultant β radiation is measured with a microdensitometer. Distribution of pile neutrons in a block of paraffin, as measured with a Au detector and Kodak 1357 film, is shown graphically as an example. The diffusion length thus measured agrees with the value 2.42 ± 0.04 (Phys. Rev. 80, 756(1950)).

4156
DIFFUSION CLOUD CHAMBER WITH VERTICAL UPWARDLY DIRECTED DIFFUSION STREAM. Paul Harteck and Gerhard Hertz. Naturwissenschaften 39, 206-7(1952) May. (In German)

The "upward" diffusion cloud chamber described has a ceiling cooling system of solid CO_2 and boiling NH_3 to provide temperatures between −33 and −60°C. Since the diffusing vapor condenses and falls back to the floor, no pumping or refilling is necessary. Various vapor-gas filling mixtures are discussed.

4157
AUTOMATIC DETERMINATION OF RADIOACTIVITY ON FILTER PAPER CHROMATOGRAMS. Louis B. Rockland, José Lieberman, and Max S. Dunn. Anal. Chem. 24, 778-82 (1952) May.

An automatic sample changer was developed to permit the rapid survey and accurate counting of filter paper chromatograms with the aid of two types of recording counters and other standard apparatus for the determination of radioactivity. Examples are given of radioactive counts made of

glycine-2-C^{14} spotted at five concentrations on Whatman No. 1 filter paper and of a typical phenol-developed test tube chromatogram of glycine-2-C^{14}. The average recovery of radioactivity in glycine-2-C^{14} spotted at the origin was 85 ± 6%. The R value (0.48) of a chromatogram stained with ninhydrin coincided with that estimated from the peak of the radioactive curve. This apparatus may be employed to measure radioactivity of compounds containing higher energy, as well as carbon, radioisotopes on one- or (sectioned) two-dimensional chromatograms. (auth)

4158
A NEW NUCLEAR-RESEARCH EMULSION. A. J. Herz and C. Waller. Phil. Mag. 43, 592-4(1952) May.

An experimental emulsion "Type GO" has been produced which differs from G5 emulsion only in that it is less sensitive. The GO emulsion is processed by exactly the same methods as G5; it is therefore possible to use thick layers, and to make sandwiches of GO and G5 emulsion on the same glass base. The GO emulsion has been used to identify heavy nuclei with very satisfactory success.

159
ON THE DIPPING COUNTER. Tadashi Oshida, Hirohide Miwa, and Toshio Kato. Proc. Phys. Soc. Japan 7, 114-15 (1952) Jan.-Feb.

A dipping type G-M counter for counting liquid samples is described. A method for preparing the fragile glass window is reported.

4160
GEIGER-MÜLLER COUNTERS. N. Warmoltz. Philips Tech. Rev. 13, 282-92(1952) Apr.

The historical development of Geiger-Müller counters from the first original type up to the present-day designs is discussed with reference to the properties of gas discharges, with a brief indication of the various ways in which a gas-discharge tube can be used for counting ionizing particles or quanta. Particular consideration is given to the properties of counting tubes in the "Geiger-Müller range" (plateau) and the classification of existing counters into those with statistical quenching and those with space-charge quenching. The properties of the argon-hydrogen counter, an example of a statistically quenched tube, and those of the counter with an organic gas as quenching agent, an example of a counter with space-charge quenching, are gone into more closely. Finally the new self-quenching counters with halogen as quenching agent are described in various constructions and applications, mention being made, among others, of a low-voltage counter with a starting voltage of 250 volts, some types of beta and gamma counters with mica window, and a counter of great sensitivity for x rays of about 1 to 2 A wavelength; these counters have a practically unlimited life. (auth)

4161
COUNTING LOSSES OF LONG BEADED COUNTERS FOR X-RAY MEASUREMENTS. Itaru Nonaka. J. Phys. Soc. Japan. 7, 89-92(1952) Jan.-Feb.

It has been verified experimentally that a G-M counter having several glass beads on its central wire is very useful in x-ray measurement because of its low counting losses. The counting losses of such beaded counters were calculated theoretically in several cases. The losses are reduced to about 1/n of non-beaded counters in the cases of short wave lengths, n being the number of sections, and this factor increases with the wave length of x rays. The effects of the finite ranges of secondary electrons in the counter gas is negligibly small, and the effect of the finite spreading probability of counter discharges beyond the beads is to increase slightly the reducing factor. (auth)

4162
A LIGHT EFFECT OF A DIAMOND ALPHA RAY COUNTER. Shoji Kojima and Soji Kono. J. Phys. Soc. Japan 7, 84-8 (1952) Jan.-Feb.

A diamond, cut in the form of a plate, was coated on the parallel faces with evaporated Al. When the crystal was bombarded by α rays on the side, the counting rate was decreased by light. The wave length responsible for the effect was about 5000 A. This light, applied more than one hour, did not increase the rate. In the case of the bombardment through an electrode surface an opposite effect appeared. The rate was increased by the irradiation of the visible light to an equilibrium value, which depended on the wave length. But the light, including ultraviolet, decreased the rate after the maximum point. The increasing effect is understood as the release of the space charge. The decreasing effect seems to be attributed to the recombination of the carrier with the trapped one by the aid of the light, for the effect is observed only when the charge carrier drifts in the plasma layer where both electrons and holes are trapped. (auth)

MESONS

4163
ANALYSIS OF TWO σ STARS. B. Cougnet, J. Roederer, and P. Waloschek. Z. Naturforsch. 7a, 201-2(1952) Feb.

Two events observed in Ilford G5 emulsion exposed in the Argentine cordillera at between 3600 and 5200 m are attributed to the reactions $C^{12} + \pi^- \rightarrow Li^8 + He^3 + n$ and $C^{12} + \pi^- \rightarrow 2He^4 + H^3 + n$. Energies of each particle are discussed.

4164
PION-PROTON SCATTERING AND THE STRONG COUPLING MESON THEORY. G. Wentzel. Phys. Rev. 86, 437-9(1952) May 15.

From the pseudoscalar charge-symmetric strong-coupling meson theory, scattering cross sections are derived for meson energies well below resonance and at resonance with an excited nucleon state. (auth)

4165
NOTE ON THE STATISTICAL THEORY OF THE MESON SHOWER. S. Takagi. Progress Theoret. Phys. (Japan) 7, 123-5(1952) Jan.

The Fermi theory of meson showers is modified, and the multiplicity and angular distribution of pions produced is discussed.

4166
CAPTURE OF NEGATIVE μ MESONS IN COPPER AND TIN. André Lagarrigue and Charles Peyrou. Compt. rend. 234, 1873-5(1952) May 5. (In French)

The reaction $\mu^- + P(N) \rightarrow P(N) + e^-$ was sought in cloud-chamber studies with Cu and Sn screens. From 9000 photographs the ratios of μ^- mesons emitting electrons to total μ^- mesons were found to be 0.095 ± 0.042 and 0.068 ± 0.040 for Cu and Sn, respectively. When these values were combined with the decay times of μ^+ and μ^- mesons, the probabilities of capture by electron emission, λ_e, divided by the total capture probabilities $\lambda_e + \lambda_\nu$, where ν refers to the reactions $\mu^+ + P \rightarrow N + \nu$, were only 4 ± 5% and 4.3 ± 4%, respectively. Thus electron-emission capture of μ^- mesons is forbidden or very improbable.

4167
MEAN LIFE OF THE POSITIVE π-MESON. William L. Kraushaar. Phys. Rev. 86, 513-17(1952) May 15.

Photoproduced π^+ mesons stopped and decayed in a xylene-terphenyl liquid scintillation counter. The pulses from the counter were amplified and displayed on two oscilloscopes. The entire sequence $\pi^+ \rightarrow \mu^+ \rightarrow e^+$ could be observed, and from the measurement of 670 π-μ decay times, a value of $2.53 \pm 0.10 \times 10^{-8}$ sec was obtained for the π^+ mean life. (auth)

4168
MESON PRODUCTION BY γ-RAYS FROM DEUTERIUM. Yosio Saitô, Yoiti Watanabé, and Yoshio Yamaguchi. Progress Theoret. Phys. (Japan) 7, 103-21(1952) Jan.

The $\pi^{\pm}$ and π^0 photomesons from deuterium, which are expected to give a definite clue to photomesons from neutrons and spin- and charge-dependences of photo-meson processes, are discussed phenomenologically, adopting the so-called impulse approximation. Energy spectra of mesons at three angles (0, 45 and 90°) are given for incident γ rays with 200, 250, 300, and 350 Mev. The results will be useful for direct comparison with observed data. (auth)

4169

STUDY OF A CASE OF KAPPA-MESON DISINTEGRATION OBSERVED IN PHOTOGRAPHIC EMULSION. J. Crussard, A. Lecourtois, C. Mabboux, D. Morellet, and J. Trembley. J. phys. radium, 19S-20S(1952) Apr. (In French)

An event observed in nuclear emulsion exposed during a balloon flight to 35,000 m is described. A particle coming to rest in the emulsion decayed with emission of a secondary with a range of 25,000 μ. It is concluded that the secondary was a μ meson and that the primary had the mass 1000 (+500, −350) m_e and was a κ meson.

4170

THE OCCURRENCE OF HEAVY MESONS IN PENETRATING SHOWERS. R. B. Leighton and S. D.Wanlass. Phys. Rev. 86, 426-7(1952) May 1.

In the course of a cloud-chamber study of penetrating showers, two events have been observed which probably represent the decay in flight of τ mesons, and one event which probably represents the decay in flight of a κ meson. The mass of the τ meson was calculated to be ~975 m_e; it decays into three charged particles which are consistent with π mesons. The τ-meson mean life appears to be considerably longer than that of the V^0. The κ meson decays into a single charged particle (either a π or μ meson) and presumably one or more neutral particles; its mass is 1200 ± 300 m_e. This preliminary survey has also yielded three tracks which may indicate the existence of a particle whose mass lies in the range 400-650 m_e.

4171

PION PRODUCTION AND CHARGE INDEPENDENCE. J. M. Luttinger. Phys. Rev. 86, 571-2(1952) May 15.

The observation of pion production in nucleon-nucleon and in nucleon-deuteron collisions provides a very severe test of the assumption that the interaction between pions and nucleons is charge independent. For p + d or n + d collisions, the assumption of charge independence implies that $\sigma_+ + \sigma_- = 2\sigma_0$, where σ_+ is the cross section for producing π^+ mesons at any angle and energy, and σ_- and σ_0 are the corresponding cross sections for π^- and π^0 mesons, respectively. Also $\sigma(p + p \rightarrow p + n + \pi^+) = 2[\sigma(n + p \rightarrow n + p + \pi^0) + \sigma(p + p \rightarrow p + p + \pi^0) - \sigma(n + p \rightarrow n + n + \pi^+)]$, and this is also independent of energy or angle.

4172

NEUTRAL-MESON PRODUCTION BY GAMMA-RAY. Shigeo Minami. Progress Theoret. Phys. (Japan) 7, 69-91 (1952) Jan. (cf. NSA 6-3030)

By means of the Lorentz-covariant perturbation and renormalization methods, the effective cross section for the γ-π^0 process in pseudoscalar meson theory has been obtained with the matrix elements calculated up to the order ef^3. The most conspicuous result, which could not be reached in the lowest order calculation, is that the cross section for neutral-meson production turns out to be of the same order as that for charged meson, and that the angular distribution for that process is larger in the forward than in the backward direction. Further a Pauli-type interaction with suitably chosen coupling constants is introduced in order to estimate the effect of the matrix elements of orders higher than ef^3, and a result similar to the above one is gained, but with a smaller value for the coupling constant. (auth)

4173

MESON REACTIONS IN DEUTERIUM AND MESON-NUCLEON SCATTERING. Yoshio Yamaguchi. Progress Theoret. Phys. 7, 93-102(1952) Jan.

Various meson reactions in deuterium are investigated on the basis of impulse approximation. The close connection between deuteron data and nucleon data, which is shown to be useful to get an insight into the spin and charge dependences of meson-nucleon interaction is obtained. Brief discussions of available results of experiments are also given. (auth)

4174

THE PRODUCTION OF NEUTRONS BY μ-MESON CAPTURE IN LEAD, MAGNESIUM, AND CALCIUM. Anna Maria Conforto and R. D. Sard. Phys. Rev. 86, 465-75 (1952) May 15.

Measurements are reported of the yield of disintegration neutrons from the capture of stopped negative μ mesons in Pb, Ca, and Mg. A magnetized iron lens is used to separate μ-meson capture from other processes giving rise to neutrons associated with telescope anticoincidences. The functioning of the lens is tested experimentally by observation of decay electrons from stopped mesons; as a byproduct, the competition between capture ($\tau_- = 1$ μsec for Mg) and natural decay ($\tau_0 = 2.15$ μsec) is confirmed. With Pb, there is a striking increase in the coherent neutron rate in switching from focusing positive to focusing negative mesons. The average number of disintegration neutrons per capture appears to be 1.47 ± 0.13, as compared with the value 2.16 ± 0.15 obtained by Crouch and Sard in an underground experiment. With both Mg and Ca, there is little, if any, neutron production in μ-meson capture. The neutron-detecting efficiency is the same as for Pb, but the ratio of neutrons detected to mesons captured is 0.6 ± 0.5 percent for Mg and for Ca, in contrast with 3.1 ± 0.3 percent for Pb.

4175

THE BURST PRODUCTION BY THE μ-MESON. H. Komori, K. Miyanaga, and S. Ogawa. Progress Theoret. Phys. (Japan) 7, 122-3(1952) Jan.

An analysis is made of the burst production by the μ meson at sea level. A graph is presented giving plots of the data of various investigators as the burst frequency against the size and energy at sea level.

4176

COMMUNICATION ON THE KAPPA MESON. Louis Leprince-Ringuet. J. phys. radium 13, 18S-19S(1952) Apr. (In French)

Seven κ-meson decays have been observed so far. Apparently this decay process gives a continuous spectrum of μ mesons. At least two neutral particles, presumably neutrons, are emitted at the same time. Calculations are in progress on the decay mechanism which will give an indication of the spin and nucleon interaction of the κ meson.

4177

UNUSUAL $\pi-\mu$ DECAYS IN PHOTOGRAPHIC EMULSIONS. W. F. Fry. Phys. Rev. 86, 418-19(1952) May 1.

A total of 10,686 $\pi-\mu$ decays has been observed in nuclear emulsions exposed in the meson beams of the University of Chicago cyclotron. The data concerning thirteen unusual events are tabulated and discussed. One μ meson had a range of 1035 μ. The unusually short ranges of 7 μ mesons apparently cannot be explained by π decay in flight. The percentage of unusual $\pi-\mu$ decays and the energy distribution of the μ mesons appear to be in general agreement with the theoretical predictions based on a soft-photon emission accompanying the charge acceleration of the μ mesons from the π-meson decays.

4178

π MESONS AND QUANTIZED FIELD THEORIES. Gerhart Lüders, Reinhard Oehme, and Walter E. Thirring. Z. Naturforsch. 7a, 213-34(1952) Mar.-Apr. (In German)

Description of mesons by a renormalizable field theory is discussed on the basis of available theoretical and experimental information, several new viewpoints being presented. The spins of both charged and neutral π mesons are shown to be zero. Coupling possibilities between mesons, nucleons, and photons are limited. Special problems considered are order of magnitude of the coupling constant from capture of π mesons in H_2, scattering of mesons by nucleons, meson excitation by quanta and nucleon collision, and absorption of π^+ mesons by deuterons.

MOLECULAR PROPERTIES

4179

Solid State and Molecular Theory Group, Mass. Inst. of Tech. QUARTERLY PROGRESS REPORT NO. 4. Apr. 15, 1952. 26p. (NP-3825; Quarterly Progress Report No. 4; U22051)

Investigations are in progress on a soluble problem in energy bands, self-consistent field calculations for Cu^+, energy bands in solids, paramagnetic energy levels in chrome alum, molecular orbital calculations for the ClO_4^- ion, theory of molecular O, wave functions for the diamond structure, superlattice stability, theory of ferromagnetism, and study of the dielectric constant and conductivity of Ge in a resonant cavity. (cf. TIP U20664) (NRS abst.)

NEUTRONS

4180

Argonne National Lab.

THE NEUTRON SPECTRUM OF A RADIUM-BERYLLIUM PHOTO SOURCE; EXCERPT FROM ANL-4476, by C. Eggler. July 5, 1950. Decl. May 28, 1952. 10p. (AECD-3385; ANL-HDY-705)

A Ra-Be photoneutron source has been proposed by the National Bureau of Standards as a possible primary and permanent standard for the measurement of neutron fluxes. The neutron spectrum of this source has been measured with a cloud chamber by the recoil-proton technique. A histogram of the recoil-proton spectrum is shown, and nuclear and experimental corrections necessary for calculation of the neutron energies are tabulated. Neutron groups were indicated at 70, 190, 310, 480, and 640 kev, corresponding to Ra γ energies of 1.750, 1.884, 2.019, 2.210, and 2.390 Mev, respectively. No evidence was found for the 1.69-Mev γ line reported by Latyshev (Zhur. Eksptl'. i Teoret. Fiz. 10, 996(1940)).

4181

Oak Ridge National Lab.

THE SLOWING DOWN DISTRIBUTION FROM A POINT SOURCE OF FISSION NEUTRONS IN LIGHT WATER, by J. E. Hill, L. D. Roberts and T. E. Fitch. Issued Dec. 10, 1948. Decl. May 29, 1952. 29p. (AECD-3392; ORNL-181)

The distribution in water of indium resonance neutrons originating at a point fission source was measured in the range of distances from the source, $0 \leq r \leq 92.20$ cm. The equipment and procedure used are described in detail and results are discussed.

4182

Oak Ridge National Lab.

SLOWING DOWN OF FISSION NEUTRONS IN GRAPHITE; FINAL REPORT, by J. E. Hill, L. D. Roberts, and G. McCammon. Issued Jan. 19, 1949. Decl. May 29, 1952. 35p. (AECD-3390; ORNL-187)

$\bar{\tau}$, $\bar{\tau}^2$, and $\bar{\tau}^3$ have been measured for a plane fission source in graphite. The values $\bar{\tau} = 310.6$ cm^2, $\bar{\tau}^2 = 11.48 \times 10^4$ cm^4, and $\bar{\tau}^3 = 5.23 \times 10^7$ cm^6 were obtained. The value of $\bar{\tau} = 310.6$ cm^2 is lower than the previously accepted value of 317 cm^2. It seems likely that certain transport corrections may not have been applied to the data in the earlier work, and that the difference between the earlier value and the present result is due to this. (auth)

4183

THE ELECTRON NEUTRON INTERACTION. Burton D. Fried. Phys. Rev. 86, 434-5(1952) May 1.

A calculation of the electromagnetic properties of neutrons has been carried out with special attention to the matter of interpretation of the terms obtained from field theory. Pseudoscalar mesons and pseudoscalar coupling, with the usual weak-coupling perturbation theory carried to second order in the meson-nucleon coupling, were used to evaluate the neutron-electron interaction. The value for the equivalent well depth V_0 was found to be −5.38 kev. The relation of these results to the various results obtained by other authors is explained.

4184

THE NEUTRON-ELECTRON INTERACTIONS. Sidney Borowitz. Phys. Rev. 86, 567(1952) May 15.

Two effects are noted in the interaction of the neutron with the electrostatic field of an electron. The two effects differ as follows: they arise from the interaction of the field of the electron with the neutron polarization current in the first case, and with the neutron convection current in the second. The ratio between the two effects has been calculated by assuming an interaction of the neutron with asymmetric pseudoscalar mesons. If one fixes the coupling constant in order that the theory yield the phenomenological value for the neutron moment, the convection-current contribution to the neutron-electron interaction is 1208 ev. The total interaction would thus be equal to 5108 ev.

4185

POLARIZATION OF D-D NEUTRONS. H. J. Longley, R. N. Little, Jr., and J. M. Slye. Phys. Rev. 86, 419-20(1952) May 1.

A method proposed by Schwinger (Phys. Rev. 73, 407 (1948)) has been used to measure the polarization of fast neutrons from the D-D reaction at very low bombarding energies. By comparing the fraction of neutrons emerging polarized at 45° from the source with the fraction emerging polarized after scattering through 3.23° or 4.47° in a Pb scatterer, the polarization at 45° was found to be ~30% (30% by comparison with 4.47° scattering, and 40 ± 20% by comparison with 3.23° scattering.)

NUCLEAR PHYSICS

4186

Technical Information Service, AEC

GERMAN REPORTS ON ATOMIC ENERGY; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE, by Lore R. David and I. A. Warheit, comps. June 6, 1952. (TID-3030)

Abstracts are presented for the 394 German documents on atomic energy which were turned over to the Manhattan District U. S. Engineers by the ALSOS Mission. Subject and author indexes are also supplied. (auth)

4187

β TRANSITIONS AND NUCLEAR STRUCTURE. I. THEORETICAL CONSIDERATIONS; NUCLEAR STRUCTURE. R. Nataf and R. Bouchez. J. phys. radium 13, 81-93(1952) Feb. (In French)

Correlation between the predictions of the nuclear shell model and experimental data on β decay is attempted. In addition to the total angular momentum quantum number J and the parity, a nuclear orbital quantum number L is introduced; i.e., Russell-Saunders coupling is assumed. In

reality, the coupling is not rigorously R-S, principally because of noncentral forces, but it can be represented by superposition of a small number of configurations in (L,S). In addition, the principal configurations are characterized by L, L ± 2, ... of the same parity, which is that of the nucleus. These hypotheses, which permit the interpretation of most values of the magnetic moments, are of particular value in the study of odd nuclei. Finally, an order of filling of the shell, different for neutrons and protons, is indicated.

4188
β TRANSITIONS AND NUCLEAR STRUCTURE. II. THEORETICAL CONSIDERATIONS; β TRANSITION PROBABILITIES. R. Nataf and R. Bouchez. J. phys. radium 13, 190-9 (1952) Apr. (In French)

Expressions are derived for the partial β transitions from an initial nuclear configuration (L,S) to a final configuration (L′,S′), assuming that the parities of L,L′ are those of the initial and final states, respectively. The expressions depend on $\Delta J \equiv | J-J' |$ and $\Delta L \equiv | L-L' |$. The probability of total β transition can be deduced from the amplitudes of the partial probabilities, if the respective amplitudes of the possible initial and final (L,S) and (L′,S′) configurations are known. When several configurations with amplitudes of the same order intervene, a single partial probability suffices in practice, and the usual expressions dependent on ΔJ and parity change are obtained.

4189
RELATIVISTIC THEORY OF NUCLEAR FORCES. V. PROPERTIES OF THE NEUTRON-PROTON SYSTEM AT LOW ENERGIES. Maurice Lévy. Compt. rend. 234, 1744-6(1952) Apr. 28. (In French)

The expressions derived in parts I to IV for the interaction produced by a pseudoscalar symmetrically charged meson field are used to calculate the effective interaction distance for the ^1S state of the neutron-proton system and for the $^3S + {}^3D$ state (deuteron). Values of 1.78 and 1.185 $\hbar/\mu c$, respectively, were found. The electric quadrupole moment and magnetic moment of the triplet state were calculated to be 2.08×10^{-27} cm^2 and 0.8503 Bohr magnetons, respectively.

4190
ZERO-ZERO TRANSITIONS. S. D. Drell and M. E. Rose. Progress Theoret. Phys. (Japan) 7, 125-7(1952) Jan.

A discussion is given of the decay of a nucleus from an excited level of 0 spin to a lower-lying state of 0 spin with no parity change. The solutions to the Dirac equation for an electron of spin ½ moving in the field of a charge distribution of finite radius is discussed.

4191
AN ARGUMENT AGAINST THE MAJORANA THEORY OF NEUTRAL PARTICLES. E. R. Caianiello. Phys. Rev. 86, 564-5(1952) May 15.

Consideration is given to the question of whether the neutrino is a Dirac or Majorana particle. The Majorana theory is ruled out by proving that the condition of self charge-conjugation is incompatible with the usual invariance requirements; identity of a field with its charge-conjugate is impossible, because they transform differently under space reversal. The rejection of the Majorana theory for the neutrino would not forbid the interpretation of double beta-decay phenomena, should they be definitely proved to occur.

4192
REMARK ON NORDHEIM'S RULE RELATIVE TO ANGULAR MOMENTS OF ODD-ODD NUCLEI. Roger Nataf. Compt. rend. 234, 1972-4(1952) May 12. (In French)

The empirical rule between orbital and angular moments given by Nordheim (Revs. Modern Phys. 23, 322(1951)) on the basis of Mayer's shell model is shown to result in j-j coupling between the odd proton and odd neutron and to require the most stable state of the nucleus to be principally the triplet state for these two nucleons. An L-S coupling cannot explain this; the j-j coupling is therefore a better approximation in the region studied (A > ~30).

NUCLEAR PROPERTIES

4193
Radiation Lab., Univ. of Calif.
FIRST EXCITED STATES OF EVEN-EVEN NUCLIDES IN THE HEAVY ELEMENT REGION, by Frank Asaro and I. Perlman. Apr. 25, 1952. 5p. (UCRL-1784)

An α-particle spectrometer was used to study the nuclides of U and higher atomic numbers. The energy levels reached by the nuclides were all in a narrow range. The two α groups for each of the nuclides Cm^{244}, Cm^{242}, Pu^{240}, Pu^{238}, and U^{234} fell between 41 and 47 kev. Nuclides of lower mass numbers showed higher energies for their first excited states. The energy levels of the first excited states are plotted against neutron numbers with isotopes of each element joined. The levels for Pu, U, and the heaviest Th isotopes are all within a range of about 10 kev. Rn^{218}, Rn^{220}, and Rn^{222} have not revealed low-energy groups.

4194
Radiation Lab., Univ. of Calif.
THE MASSES OF THE HEAVY ISOTOPES, by Martin O. Stern. Apr. 14, 1952. 17p. (UCRL-1728)

Radioactive decay data are used to calculate the atomic masses of the heavy isotopes, A ≥ 203. The four radioactive families are then connected by means of neutron binding energies known from (n,γ), (γ,n) and (d,p) reactions on various target isotopes. Finally, all the masses are collectively adjusted for the best fit with mass spectrographic information available in this region. The masses so calculated are tabulated. Differences between masses of isotopes are estimated to have an error of ±0.00020 mass units or about 200 kev; the position of the masses taken collectively is in doubt by about 1.5 Mev. (auth)

4195
[Metallurgical Lab., Univ. of Chicago]
EFFECT OF TEMPERATURE ON TOTAL RESONANCE ABSORPTION OF NEUTRONS BY SPHERES OF URANIUM OXIDE, by E. Creutz and H. Jupnik. [June 1942] Decl. May 27, 1952. 22p. (AECD-3386; C-110)

An uranium oxide sphere was placed inside a specially constructed furnace. The furnace was immersed in a graphite block and bombarded with neutrons. Various arrangements of uranium oxide, surrounded by B- or Cd-containing material to absorb thermal neutrons, were bombarded. The 24-min γ activity induced by resonance neutrons was measured as the temperature inside the furnace was varied from 20 to 1000°C. Results are tabulated and discussed.

4196
Metallurgical Lab., Univ. of Chicago
EFFECT OF GEOMETRY ON RESONANCE ABSORPTION OF NEUTRONS BY URANIUM and SUPPLEMENT NO. 1, by E. Creutz, H. Jupnik, and T. Snyder. [June 1942] Decl. May 27, 1952. 51p. (AECD-3387; C-116)

Various sizes of spheres of U and U_3O_8 were neutron-irradiated while immersed in a graphite block. The activity of U^{239} was measured to determine the total resonance absorption of neutrons. Results are tabulated and graphed showing the surface and volume effects on the total neutron resonance absorption. A supplement clarifies the terminology in the report.

4197
Argonne National Lab.
INTERMEDIATE COUPLING AS ENCOUNTERED IN SOME OF THE p-SHELL NUCLEI, by D. R. Inglis. Apr. 1952. 15p. (AECU-2043; UAC-564)

The impressive success of the (jj) coupling shell nuclei in the heavy nuclei and its almost as spectacular failure in the light nuclei of the p-shell, from helium to oxygen, has left the question whether these light nuclei might be interpreted in terms of intermediate coupling, between the (jj) and (LS) extremes, or whether some other phenomenon such as nascent alpha-clustering or (other) excessive complication of configuration interaction must be called upon to explain the irregularities. Experimental knowledge of the spectra of these nuclei is now becoming sufficiently extensive that it seems worth exploring the possibility of an interpretation in terms of intermediate coupling in some detail, especially to see if the general features of level density of the low states, elevation of the first state of higher isotopic, etc., may be accounted for. As more identifications of nuclear spin and parity of the excited states become known, further tests of the validity of the intermediate coupling interpretation will be possible. Nuclei of three atomic weights are treated as examples of the sort of interpretation that may be encountered, A = 6 and 14 because of the facility with which the complete analysis of the p-shell states may be carried out, and A = 12 as an example of another type of spectrum with widely spaced low states and high excitation of the higher isotopic spin. (auth)

4198

Los Alamos Scientific Lab.

SEARCH FOR EXCITED STATE IN He^4. EXPERIMENTAL DETERMINATION OF THE Q VALUE FOR THE T(d,n) He^4 REACTION, by Louis Rosen. Feb. 1952. 13p. (LAMS-1383)

The energy distribution of the neutrons from the $H^3(d,n)He^4$ reaction has been investigated with a view towards detecting the existence of excited states in the He^4 nucleus. There is no indication of a second group of neutrons corresponding to an energy level in the He^4 nucleus in the energy region 2 to 14.5 Mev. The Q for the $T(d,n)He^4$ reaction has been determined to be 17.7 ± 0.3 Mev, in good agreement with the Q calculated for the masses involved. (auth)

4199

REMARKS ON THE ADIABATIC NUCLEAR POTENTIAL. Shigeru Machida and Kazuhiko Nishijima. Progress Theoret. Phys. (Japan) 7, 57-68(1952) Jan.

The validity of the approximation method of the adiabatic nuclear potentials, especially of the fourth-order nuclear potential derived from pseudoscalar meson theory, is discussed. It is shown that the effects of time conponent of pseudovector coupling on the pseudoscalar meson potential are not large when the distance between two nucleons is larger than about half of the force range. Time variation of nucleon spin and τ spin are evaluated for phenomenological and meson potentials, and critical radii for their applicability are derived. Implications of the velocity-dependent forces in the interior region are discussed, and largeness of the purely quantum mechanical effects in the meson theory is pointed out. The hamiltonian for a two nucleon system in the intermediate coupling approximation is given. Features of the meson-nucleon interaction are compared with that of the photon-electron interaction. It is pointed out that the transition matrix of the nucleon-nucleon collision is not analytic with respect to nucleon energy at the threshold for meson production. An ambiguity occurs in calculating the sixth-order nuclear potential. (auth)

4200

THE RANGE OF TENSOR FORCES IN THE DEUTERON GROUND STATE. D. G. Padfield. Proc. Phys. Soc. (London) A65, 309-20(1952) May.

A set of nuclear parameters (ranges and depths of potential wells) yielding the established values of the binding energy, quadrupole moment and magnetic moment of the deuteron, and consistent with the other experimental data relevant to the ground state of the neutron–proton system has been found. (auth)

4201

ANGULAR DISTRIBUTION IN (d,p) AND (d,n) REACTIONS. A. B. Bhatia, Kun Huang, R. Huby, and H. C. Newns. Phil. Mag. 43, 485-500(1952) May.

The angular distribution of the particles emitted in (d,p) or (d,n) reactions is calculated, assuming a stripping process, by means of the Born approximation. The result resembles in most respects that of more complicated calculations by S. T. Butler, but there are certain differences which are discussed in relation to experiments which have been, or may be done. The particles are emitted mainly at fairly small angles to the incident direction, and the precise shape of the distribution is simply related to changes of angular momentum and parity occurring. The principal unknowns in the formulas are matrix elements, which may be estimated for sufficiently high energies by the statistical method. (auth)

4202

ON THE BINDING ENERGIES OF LIGHT NUCLEI. Jyumpei Sanada and Yasukazu Yoshizawa. J. Phys. Soc. Japan 7, 99-102(1952) Jan.-Feb. (cf. NSA 5-6423)

The binding energies of the last neutron and proton, and of the last neutron-proton pair in nuclei, whose mass number is A≤36, are investigated by utilizing mass values. Those of the last neutron-proton pair in nuclei having A~61 are also investigated. The curves of the binding energy vs. nucleon number show the large binding energies and the breaks at 6 and 14 neutrons or protons and 28 protons like those occurring at the positions of shell-closing in atoms. (auth)

4203

THE D-D CROSS-SECTION AND ANGULAR DISTRIBUTION BELOW 50 kev. J. Moffatt, D. Roaf, and J. H. Sanders. Proc. Roy. Soc. (London) A212, 220-34(1952) Apr. 22.

The cross-section and angular distribution of the protons from the D-D reaction have been studied with bombarding energies between 15 and 50 kev using a thin gas target. The cross-section results show a significant deviation from the simple Gamow theory of penetration through a coulomb barrier. Both this deviation and the asymmetry of the reaction at even the lowest energies can be explained consistently by the contribution to the reaction of waves of non-vanishing angular momentum. Analysis of the results in terms of such waves gives some indication that spin-orbit coupling is a significant factor in the transitions. (auth)

4204

NUCLEAR SPINS OF SAMARIUM 147 AND 149. G. S. Bogle and H. E. D. Scovil. Proc. Phys. Soc. (London) A65, 360-0 (1952) May.

Murakawa and Ross (Phys. Rev. 82, 967(1951)) reported the nuclear spins of Sm^{147} and Sm^{149} as ½ in each case. They based this on their observation of a maximum of six hyperfine structure components in the optical spectra of the separated isotopes. By means of paramagnetic resonance measurements on the ethyl sulfate of naturally occurring Sm the spin was determined to be ½. The experimental evidence is presented.

4205

THE PARAMAGNETISM OF SAMARIUM ETHYL SULPHATE; THEORY. R. J. Elliott and K. W. H. Stevens. Proc. Phys. Soc. (London) A65, 370-1(1952) May.

The theoretical values for $g_{\parallel}$ and $g_{\perp}$ and A/B for Sm are compared with the experimental results obtained by Bogle and Scovil (see above abstract). For $\Theta = 4°$ the values given are:

	$g_{\parallel}$	$g_{\perp}$	A/B
Theory	0.66	0.66	0.24
Experiment	0.595	0.605	0.24

A brief discussion is also given which tentatively predicts that all isotopes with an odd number of neutrons between 82 and 99 will have spins of 7/2 or just possibly 9/2.

4206

NUCLEAR MAGNETIC RESONANCE IN AN ANTI-FERROMAGNETIC SINGLE CRYSTAL. PART I. N. J. Poulis and G. E. G. Hardeman. Physica 18, 201-20(1952) Apr. (In English)

Nuclear magnetic resonance absorption of protons in a single-crystal of $CuCl_2.2H_2O$ has been studied. At temperatures of liquid H the resonance diagrams are similar to those in single-crystals of the paramagnetic salt $CuSO_4.5H_2O$. In the liquid-He region, however, the resonance diagrams are always symmetrical about the proton line in water. This symmetry and also the temperature dependence of the resonance lines indicate that $CuCl_2.2H_2O$ is antiferromagnetic below about 4.3°K. A threshold value of the magnetic field as predicted by Néel (Ann. phys. (11) 5, 232(1936)) has been found. Measurements have been carried out both in a field below and in a field above this threshold value. From the measurements in weak fields the position of the protons in the crystal can be calculated. (auth)

4207

NOTE ON CONFIGURATION PROBABILITIES. A. J. F. Siegert. J. Chem. Phys. 20, 572-3(1952) Apr.

The series obtained by Goldberger and Adams (J. Chem. Phys. 20, 240(1952)) are derived by a simpler method and generalized to include systems of particles with Bose and Fermi statistics and spin, if spin dependent terms in the hamiltonian are neglected. (auth)

4208

A PREFERRED-NUMBER CORRECTION TO THE BETHE-WEISZÄCKER FORMULA FOR THE NUCLEAR BINDING ENERGIES. A. H. Wapstra. Physica 18, 83-90(1952) Feb.

It is investigated how far the Bethe-Weiszäcker formula for the nuclear binding energies explain the details of the β stability if terms are included taking into account the occurrence of nuclear shells. It is found that these bell shaped additions to the binding energy about closed shells should have a height of about 6 Mev at their maximum, in order to explain the β stability characteristics of the nuclei. (auth)

4209

SPIN AND PARITY OF THE FIRST (603-KEV) EXCITED STATE OF Te^{124}. Franz R. Metzger. Phys. Rev. 86, 435 (1952) May 1.

The K-conversion coefficient of the 603-kev γ ray in Te^{124} has been determined experimentally to be $\alpha_K = 4.25 \pm 0.3 \times 10^{-3}$. By comparison with the theoretical conversion coefficients of Rose et al., the 603-kev γ ray is unambiguously characterized as electric quadrupole and the first (603-kev) excited state of Te^{124} as 2, even. A comparison of the measured conversion coefficient with the ratio of conversion electrons to β rays indicates that the 603-kev γ ray is only connected with 40 to 50% of the Sb^{124} disintegrations.

4210

REGULARITIES IN THE TOTAL CROSS SECTIONS FOR FAST NEUTRONS. H. H. Barschall. Phys. Rev. 86, 431 (1952) May 1.

A three-dimensional figure is presented which shows clearly the similarity in shape of total neutron cross-section curves for elements of neighboring atomic number. The measured cross sections divided by the geometrical area of the nucleus are plotted against neutron energies from 0.1 to 3 Mev for many elements heavier than Mn. An interesting feature of the surface is the large value of the cross section at low energies for elements around Sr. This peak appears to shift to higher energies with increasing atomic weight. Furthermore, the cross section of the elements heavier than Ir exhibit a minimum at neutron energies around 1 Mev.

4211

A FEW PROVISIONAL CONCLUSIONS FROM OBSERVATIONS ON ALIGNMENT OF COBALT NUCLEI. C. J. Gorter, H. A. Tolhoek, O. J. Poppema, M. J. Steenland, and J. A. Beun. Physica 8, 135-6(1952) Feb.

From the observed anisotropy of the γ-ray emission of aligned Co^{60}, the magnetic moment of this nucleus is estimated to be 3.2 n.m. From the dependence of the anisotropy on a magnetic field it is concluded that the hyperfine splitting of Co^{59} in the salt concerned is 0.13 cm^{-1} between consecutive levels. (auth)

4212

THE MESON THEORY OF NUCLEAR FORCES. I. THE DEUTERON GROUND STATE AND LOW ENERGY NEUTRON-PROTON SCATTERING. Mitsuo Taketani, Shigeru Machida, and Shoroku O-Numa. Progress Theoret. Phys. (Japan) 7, 45-55(1952) Jan.

Adopting the new method of the theory of nuclear forces, the deuteron ground state and low energy n-p scattering have been investigated. The symmetrical pseudoscalar π-meson potentials including second- and fourth-order terms are assumed in the outside region, while in the inside region where the static meson potential becomes meaningless, phenomenological potentials represented by square wells are adopted. It is shown that we can then account for the experimental data, if we take the value 0.09 ~ 0.10 as the magnitude of the coupling constant between π meson and nucleon. Saturation does not result from these potentials in the static approximation. (auth)

4213

THE SATURATION PROPERTY OF NUCLEAR FORCES. Hideo Kanazawa. Phys. Rev. 86, 428(1952) May 1.

The interaction potentials between nucleons in heavy nuclei are calculated according to the Fermi gas model. In summing the mean interaction energies over the occupied neutron and proton states it is found that the nonsaturating $\overline{V}_{ord}$ vanishes but $\overline{V}_{exp}$ does not.

4214

THE TOTAL NEUTRON CROSS SECTION OF NITROGEN. J. J. Hinchey, P. H. Stelson, and W. M. Preston. Phys. Rev. 86, 483-92(1952) May 15.

The total cross section of nitrogen has been measured for neutrons in the energy range 200 to 1800 kev, using scatterers of liquid nitrogen and of lithium azide. Eleven resonances were found corresponding to excited states in the compound nucleus N^{15}, with natural widths of from 3 to 54 kev. Nine of these can be identified with resonances previously known in the reactions $N^{14}(n,p)C^{14}$, $N^{14}(n,\alpha)B^{11}$, or $C^{14}(p,n)N^{14}$. From a comparison of the measured and computed elastic-scattering cross sections, J values can be assigned to most of the observed states. In some cases the parity also can be determined and the effective level spacing D_J computed for decay by neutron, proton, or α-particle emission. At least for proton emission, it must be concluded that the quantities D_J, which contain implicity the matrix elements for the transition, can vary by a factor of at least 100. (auth)

4215

EXCHANGE CURRENT EFFECTS IN THE DEUTERON. Felix Villars. Phys. Rev. 86, 476-83(1952) May 15.

It is well known that the existence of charge-carrying nuclear fields, resulting in an exchange of charge between nucleons, also gives rise to additional electromagnetic interaction terms for the nuclear system. It is commonly assumed that these effects are zero for the deuteron ground state, on account of the symmetry properties of the exchange current. The present investigation aims to draw attention to the fact that this conclusion is only true in the adiabatic approximation, which neglects the recoil of

the nucleons. In the expression for the electromagnetic interaction of charge-exchanging nucleons in motion, nuclear "two-particle currents" appear, in addition to the meson currents encountered in the adiabatic approximation. Whereas the latter are antisymmetric under charge exchange of a nucleon pair, the former are not, and give rise to electromagnetic exchange effects for the deuteron ground state. (auth)

4216

DEUTERIUM TOTAL CROSS SECTIONS FOR POSITIVE AND NEGATIVE PIONS. H. L. Anderson, E. Fermi, D. E. Nagle, and G. B. Yodh. Phys. Rev. 86, 413(1952) May 1.

The total cross sections of D for π^- mesons of ~70 to ~225 Mev and for π^+ mesons of ~60 to ~140 Mev have been determined by comparing the transmission of pions through nearly identical H_2O and D_2O cells. Scintillation counters were used to measure the transmission. The observed $(\sigma_D - \sigma_H)$ cross sections were corrected for those specifically nuclear events which scatter particles into the last counter. By adding σ_H to $\sigma_D - \sigma_H$, values were obtained for σ_D. Within experimental errors σ_D is the same for pions of either sign.

4217

GAMMA-GAMMA ANGULAR CORRELATION IN Pd^{106}. G. B. Arfken, E. D. Klema, and F. K. McGowan. Phys. Rev. 86, 413-14(1952) May 1.

The angular correlation of the Pd^{106} γ rays from an aqueous Ru chloride source has been investigated with NaI scintillation spectrometers. The corrected ratio $W(\pi)/W(\pi/2)$ for the 624-513 kev cascade was found to be 1.91. When the spectrometers were set to count all pulses above a certain height (integral), the ratio dropped, the decrease being greater the lower the integral setting. The coincidence rate of the 1045-513 kev cascade was observed at 90°, 135°, and 180°. The data were reasonably consistent with the assignment of spin 2 to tne 1.55-Mev level.

NUCLEAR REACTORS

4218

Argonne National Lab.

PERFORMANCE OF SERVO MOTORS FOR REACTOR REGULATING RODS, by J. A. DeShong. Feb. 5, 1951. Decl. June 3, 1952. 19p. (AECD-3391; ANL-4614)

The influence of the practical limitations on seryo motor performance when applied to the control system in nuclear reactors has been studied. Both transient and sinusoidal performance are considered.

4219

[Argonne National Lab.]

CALIBRATION OF THE NEW ARGONNE STANDARD PILE, by C. Redman. Feb. 14, 1946. Decl. May 19, 1952. 7p. (AECD-3383; CP-3432)

A new standard pile, $7 \times 7 \times 10$ ft, has been erected at Argonne which will replace the smaller one ($5 \times 5 \times 9$) used at present. Indium foil measurements were made in both piles and the smaller one calibrated with respect to the larger one so that any measurement made previously in the old pile may be converted to its corresponding value in the new standard column. Diagrams and curves illustrate the calibration. (auth)

4220

Argonne National Lab.

CALIBRATION OF ARGONNE HEAVY WATER PILE (CP-3), by J. D. Richards. Aug. 15, 1949. Decl. May 27, 1952. 10p. (AECD-3388; ANL-4293)

Calibration of the CP-3 was made to determine the inhours of reactivity controlled by the control rods, the inhours of reactivity controlled by the shim rods, the number of inhours required by the Cd sleeve of the pile oscillator and the minimum moderator level at which the pile will still react.

4221

INVESTIGATION OF THE NEUTRON DENSITY IN THE CHATILLON PILE. A. Ertaud and R. Beaugé. J. phys. radium 13, 10A-13A(1952) Feb. Suppl. (In French)

Curves of the variation of neutron flux in accessible regions of the Châtillon pile are presented. The laplacian of the pile is calculated to be ~5.8/m² at a mean pile temperature of 40°C. The relation between neutron flux and power in the pile is discussed.

NUCLEAR TRANSFORMATION

4222

Radiation Lab., Univ. of Calif.

SPONTANEOUS FISSION OF U^{234}, Pu^{238}, Cm^{240} AND Cm^{244}, by A. Ghiorso, G. H. Higgins, A. E. Larsh, G. T. Seaborg, and S. G. Thompson. Apr. 21, 1952. 5p. (UCRL-1772)

The spontaneous fission rates were measured by placing the chemically purified samples on one electrode of a parallel plate ionization chamber, filled with a mixture of A and CO_2, which was connected with an amplifier followed by a register and a stylus recorder. The results are summarized as follows:

Nuclide	Fissions/g-hr	"Half-life" (years)
U^{234}	13 ± 6	$2 \pm 1 \times 10^{16}$
Pu^{238}	$5.8 \pm 2 \times 10^{7}$	$3.5 \pm 1 \times 10^{9}$
Cm^{240}	$1.0 \pm 0.2 \times 10^{11}$	$1.9 \pm 0.4 \times 10^{6}$
Cm^{244}	$1.4 \pm 0.2 \times 10^{10}$	$1.4 \pm 0.2 \times 10^{7}$

A graph also shows the sample exponential dependence of spontaneous fission rate on Z^2/A.

4223

Radiation Lab., Univ. of Calif.

DISINTEGRATION OF HELIUM BY 90 MEV NEUTRONS (thesis), by Peter E. Tannenwald. Apr. 1952. 69p. (UCRL-1767)

An abstract of this report was indexed as report UCRL-1593 and appears in Nuclear Science Abstracts as NSA 6-1004.

4224

THE EMISSION OF DEUTERONS FROM THE NUCLEUS. A. G. W. Cameron. Phys. Rev. 86, 435-6(1952) May 1.

Recent experiments have indicated that deuterons are emitted in photonuclear reactions very much more easily than would be expected from considerations of the statistical theory of nuclear reactions. An experiment is suggested to test the hypothesis that deuterons may be more easily emitted from the nucleus if they are radially polarized, with the neutron component of the deuteron forming a "bridge" to the nucleus which causes a lowering of the potential barrier in the neighborhood of the outgoing deuteron. The test depends on measurement of the angular correlation between the disintegration products of singlet deuterons emitted in nuclear reactions.

4225

REACTIONS INDUCED BY TRITONS IN A LITHIUM-CHARGED PHOTOGRAPHIC PLATE. P. Cüer and D. Magnac-Valette. J. phys. radium 13, 23S-25S(1952) Apr. (In French)

Tritons of 3.8 ± 0.4-Mev energy, produced by the Be-D reaction, were used to bombard Li-loaded Ilford E1 emulsion at a 7° angle. Elastic collisions with protons and reactions with Li^6, Li^7, and N^{14} were observed. Production of neutrons and more than two particles in these reactions confirms published results of other authors.

4226

MAGNETIC ANALYSIS OF THE $Mg^{25}(d,p)Mg^{26}$, $Mg^{26}(d,p)Mg^{27}$, AND $Mg^{26}(d,\alpha)Na^{25}$ REACTIONS. P. M. Endt, J. W. Haffner, and D. M. Van Patter. Phys. Rev. 86, 518-22(1952) May 15.

Targets of magnesium oxide, enriched in Mg^{25} and Mg^{26} content, have been bombarded by 1.8-Mev deuterons. Proton and alpha-particle groups observed at an angle of 90 degrees to the incident beam have been studied with a high-resolution magnetic spectrograph. Eleven proton groups have been assigned to the $Mg^{25}(d,p)Mg^{26}$ reaction; two proton groups were assigned to the $Mg^{26}(d,p)Mg^{27}$ reaction; and three alpha-particle groups were attributed to the $Mg^{25}(d,\alpha)Na^{23}$ reaction. The Q values for the ground-state transitions are 8.880 ± 0.010, 4.207 ± 0.006, and 7.019 ± 0.013 Mev, respectively. The following level excitations have been measured:

Mg^{26}: 1.825, 2.972, 3.969, 4.353, 4.863, 4.924, 5.270, 5.322, 5.502, and 6.147 Mev;
Mg^{27}: 0.987 Mev;
Na^{23}: 0.43 and 2.07 Mev. (auth)

4227
THE DISINTEGRATION OF N^{15} BY PROTONS. Alois Schardt, William A. Fowler, and Charles C. Lauritsen. Phys. Rev. 86, 527-35(1952) May 15.

The absolute cross sections of the reactions (1) $N^{15}(p,\alpha)C^{12}$, (2) $N^{15}(p,\alpha\gamma)C^{12}$, and (3) $N^{15}(p,\gamma)O^{16}$ have been measured from 0.2 to 1.6 Mev. The thick-target yield of reaction (1) was also measured at 0.100 Mev. Resonances were found at 0.338, 1.05, and 1.210 Mev for reaction (1); at 0.429, 0.898, 1.210, and possibly 1.05 Mev for reaction (2); and at 1.05 Mev for reaction (3). Most of the resonances follow closely the shape of the single-level dispersion formula. The 1.05-Mev resonance is asymmetric and cannot be explained as easily. The cross section of reaction (1) has been extrapolated to stellar energies and is given by $\sigma = (110/E) \times \exp(-6.95E^{-\frac{1}{2}})$ barns for E in Mev in the energy region near 0.030 Mev. (auth)

4228
EXCITED STATES OF P^{32} FROM THE $P^{31}(d,p)P^{32}$ REACTION. D. M. Van Patter, P. M. Endt, A. Sperduto, and W. W. Buechner. Phys. Rev. 86, 502-6(1952) May 15.

The $P^{31}(d,p)P^{32}$ reaction has been investigated by means of magnetic analysis of the protons emitted from thin targets containing phosphorus bombarded by 1.8- and 2.0-Mev deuterons. Sixteen of the proton groups observed have been assigned to the $P^{31}(d,p)P^{32}$ reaction, corresponding to the ground state and fifteen excited states of P^{32}, in a region of excitation from zero to 4.3 Mev. The position of the first excited state of P^{32} has been measured as 77.0 ± 1.7 kev. Three other pairs of closely spaced levels were observed. These occurred at 2.2-, 2.7-, and 3.3-Mev excitation with spacings of 50 ± 2, 92 ± 7, and 59 ± 3 kev, respectively. Because of the presence of contaminant groups, it is possible that some $P^{31}(d,p)P^{32}$ groups were missed, corresponding to states in a region of excitation from 3.3 to 4.3 Mev. The nucleus P^{32} appears to have a large number of low-lying states, with the first level very near to the ground state. (auth)

4229
ALPHA-PARTICLES FROM THE Li^7 + T REACTIONS. J. T. Dewan, T. P. Pepper, K. W. Allen, and E. Almqvist. Phys. Rev. 86, 416-17(1952) May 1.

Hydrogen, 15% T, was accelerated to 240 kev and the mass-3 beam magnetically selected to bombard a $Li_2^7SO_4$ target. The charged particles emitted at 90° to the beam were studied with a 90° magnetic analyzer and also with a large proportional counter. The energy distribution of the α particles emitted at 90° to the beam is plotted and discussed. A group at 5.95 Mev is attributed to α particles associated with the formation of He^6 in its ground state, the Q of the reaction $Li^7(t,\alpha)He^6$ is calculated to be 9.79 ± 0.03 Mev, and the He^6-Li^6 mass difference is computed to be 3.55 ± 0.03 Mev. An intense α group at 4.91 ± 0.02 Mev is associated with an excited state in He^6 formed in the reaction $Li^7(t,\alpha)He^{6*}$; the Q of this reaction is 8.08 ± 0.03 Mev; the excited level in He^6 is 1.71 ± 0.01 Mev above the ground state and is unstable by 0.78 ± 0.03 Mev against break-up into an α and two neutrons. The broad continuum in the α spectrum is composed of particles from $Li^7 + T \rightarrow He^4 + He^4 + n + n$ and α particles from the breakup of He^{6*}. If one subtracts the latter α particles, the remaining continuum accounts for 80% of the disintegrations emitting particles at 90° to the beam.

PARTICLE ACCELERATORS

4230
Institute for Nuclear Studies, Univ. of Chicago
THE UNIVERSITY OF CHICAGO 170-INCH SYNCHROCYCLOTRON; JULY 1950 – JANUARY 1952 (Final Report), by Herbert L. Anderson, John Marshall, Lester Kornblith, Jr., Richard H. Miller, and Leroy Schwarcz. [nd] 51p. (NP-3874)

The 170-in. synchrocyclotron, which accelerates protons to an energy of 450 Mev and which provides, among other things, beams of mesons of both signs over a wide range of energies, is described. The meson beams emerge through channels in a heavy shield, well collimated and well defined in energy. The present beams range in energy from 66 Mev to 230 Mev for π^- mesons, and from 66 Mev to 145 Mev for π^+ mesons. In particular, the normal operation is with 1 μa of protons falling on an internal Be target and producing about 4×10^{10} mesons/sec. In the external 122-Mev π^- beam there are 1000 π^- mesons/cm^2/sec, some 20 ft from this target, with an energy spread of ±4 Mev.

4231
OPTICAL FOCUSING IN CONSTANT RADIUS ACCELERATORS. David C. DePackh. Phys. Rev. 86, 433-4(1952) May 1.

The focusing forces are weak at low energies and large radii in electron accelerators with magnetic fields characterized by the usual parameter. A method of achieving a stronger focusing force at injection in machines of large radius is described. This consists of adding a sequence of magnetic lenses regularly spaced around the acceleration tube. The field strength of the lenses is constant in time after a possible small increase during the early part of the acceleration cycle, and the separation of the lenses should be considerably less than four focal lengths. Preliminary tests of twelve lenses equally spaced on the Naval Research Laboratory small-aperture accelerator gave excellent focusing and evidence of many electron circuits through the tube on a fluorescent screen inserted into the path of the particles.

4232
EXPRESSION FOR THE ELECTROMAGNETIC FIELD IN LINEAR ION ACCELERATORS. Michel Bernard. Compt. rend. 234, 1862-5(1952) May 5. (In French)

Solutions of Maxwell's equations are given for a semi-infinite cylinder at one end of which is placed a metallic membrane perpendicular to the axis. This arrangement is used in ion accelerators to obtain radial stability (Alvarez, Phys. Rev. 70, 799(1946)). The derivations may be extended to other systems of the same type.

RADIATION ABSORPTION AND SCATTERING

4233
THE RADIAL DISTRIBUTION FUNCTION IN LIQUID HELIUM. P. J. Price. Phys. Rev. 86, 495-6(1952) May 15.

It is pointed out that the Ornstein-Zernike-Gibbs formula, which is commonly used to connect the intensity of coherent scattering of radiation in a liquid with the thermodynamic functions, is not valid for liquid helium. Alternative formu-

las involving the radial distribution function are discussed. (auth)

4234
MULTI-OSCILLATOR PROCESSES IN THE SCATTERING OF NEUTRONS BY CRYSTALS. G. L. Squires. Proc. Roy. Soc. (London) A212, 192-206(1952) Apr. 22.

The neutron velocity selector of the Cavendish Laboratory has been used to investigate the variation of the scattering of slow neutrons with the temperature of the scatterer. Results have been obtained for nickel and magnesium. Weinstock, in a theoretical treatment of this scattering, considers processes in which the neutron exchanges one or no phonons with the vibrations of the crystal lattice. The measured values of the cross sections are found to be greater than those given by Weinstock's theory, the discrepancy reaching 30% for magnesium at 625°K. A method of calculating the cross sections for processes involving the exchange of more than one phonon is given in this paper, and it is shown that when these cross sections are added to those given by Weinstock's theory, the results agree with experiment to within 4%. (auth)

4235
MULTIPLE SCATTERING OF PROTONS IN GASES. Eugene H. Gerber. Phys. Rev. 86, 525-6(1952) May 15.

The tracks left in a cloud chamber by low-energy protons were observed in the absence of a magnetic field. Measurements of the curvature of the tracks due to multiple scattering verified quantitatively the results predicted by H. A. Bethe and W. T. Scott. For 1.08-Mev protons in air under a pressure of one atmosphere, the mean square curvature $(C^2)_{Av}$ of the measured tracks was found to be $(C^2)_{Av} = 0.323 \times 10^{-3}$ cm^{-2}, for 1.05-Mev protons in argon $(C^2)_{Av} = 0.935 \times 10^{-3}$ cm^{-2}. For helium only qualitative results were obtained; they indicated smaller curvatures than for the other gases. (auth)

4236
ANGULAR CORRELATION BETWEEN γ-RAYS AND INELASTICALLY SCATTERED PROTONS FROM Mg^{24}. H. E. Gove and A. Hedgran. Phys. Rev. 86, 574-5(1952) May 15.

Mg targets were bombarded with 7.3-Mev protons in a scattering chamber and the correlation between inelastically scattered protons from Mg^{24} leaving the nucleus in the 1.4-Mev state and the subsequent γ ray was investigated. The proton counter could be rotated from 30 to 145° with respect to the proton beam, but only the two positions of −30 and −90° to the beam were available for the γ counter. The angular-correlation data are presented in the form of graphs. With the γ counter at −90° the maximum correlation occurs when proton and γ are emitted back to back at 90° to the beam. The correlation for a γ angle of −30° shows much less pronounced variations.

4237
STOPPING POWER OF POLYSTYRENE AND ACETYLENE FOR ALPHA-PARTICLES. R. H. Ellis, Jr., H. H. Rossi, and G. Failla. Phys. Rev. 86, 562-3(1952) May 15.

An apparatus is described for comparing directly the α-particle stopping power of thin films with that of an equivalent thickness of gas. It is intended for use with water, but as an initial study polystyrene films have been compared with acetylene. There is indication that polystyrene has a stopping power slightly less than that of acetylene. The difference is less than one percent, and this is probably smaller than the present limits of accuracy of the measurements. Since this condition was found to exist throughout the alpha-range, it is concluded that the relative stopping power of gas and solid is independent of α energy.

4238
AVERAGE EXCITATION POTENTIALS AND RANGE-ENERGY RELATIONS IN LIGHT ELEMENTS. M. Bogaardt and B. Koudijs. Physica 18, 249-64(1952) Apr. (In French)

An empirical relation for the average ionization potentials of light elements is derived from published experimental data. The resulting values are used to calculate the range of α particles in H_2, He, N_2, O_2, Ne, Al, A, and CO_2 by Bethe's formula. Excellent agreement with experimental data of various authors is obtained. The differential-range observations of Mano (Ann. phys. (11) 1, 407-531(1934)) and Rosenblum (ibid. (10) 10, 408-71(1928)) are reduced to absolute values. The proportionality constant in Bloch's linear relation is calculated: $I = (12.7 \pm 0.4)\ Z$.

4239
THEORETICAL INTRODUCTION TO METHODS FOR MEASUREMENT OF MULTIPLE SCATTERING IN PHOTOGRAPHIC EMULSIONS. Bernard d'Espagnat. J. phys. radium 13, 74-80(1952) Feb. (In French)

Several procedures to be used in studying multiple scattering of charged particles by means of photographic emulsions are discussed in respect to their precision and experimental simplicity. Equations by which to compensate for systematic errors and to reduce the probable statistical error are presented.

4240
THE ENERGY DEPENDENCE OF THE CROSS SECTION FOR ELASTIC SCATTERING OF NEUTRONS BY PROTONS. Theodor Sexl and Herbert Überall. Z. Physik 132, 72-80 (1952). (In German)

Recurrence equations are derived by which the energy dependence of elastic n-p scattering can be easily calculated to any degree of approximation.

4241
INTENSITY DISTRIBUTION OF BREMSSTRAHLUNG FROM BETA-RAYS. S. J. Wyard. Proc. Phys. Soc. (London) A65, 377-9(1952) May.

The intensity distribution of bremsstrahlung from a single electron and from a beta ray spectrum are calculated. Curves are so plotted that the area under the graph, which is the total intensity of the bremsstrahlung radiated by the isotope, is unity. Check calculations were made by measuring the absorption in Pb of the bremsstrahlung from P^{32}. The agreement is good beyond 0.5 mm of Pb, but the measured points indicate a rather greater proportion of soft radiation than was calculated.

4242
SCATTERING OF PROTONS BY THE LOOSELY BOUND NEUTRON IN BERYLLIUM. K. Strauch and J. A. Hofmann. Phys. Rev. 86, 563-4(1952) May 15.

Targets of Be and C were bombarded with protons in the 112-Mev internal beam of the Harvard cyclotron. The ejected neutrons, after passing through the tank wall, were collimated by slits cut into a lead shield at angles of 0, 5, 10, 16, and 28° with respect to the proton beam. The neutrons were observed by using a scintillation-counter telescope to measure the energy distribution of recoil protons from a $CH_2 - C$ subtraction. The graphs of neutron energy distribution show a high-energy peak at 0° in Be, which decreases rapidly with increasing angle. No such peak was observed in the neutrons emitted from C. The results suggest that the loosely bound neutron in Be^9 is responsible for the peaks, while the inner core corresponding to Be^8 might behave much like the C nucleus. The results of the subtraction of the C^{12} spectrum multiplied by $(8/12)^{2/3}$ from the Be^9 spectrum are compared with differential cross sections for free n-p scattering.

4243
ANGULAR DISTRIBUTIONS OF INELASTICALLY SCATTERED PROTONS FROM C^{12} AND Mg^{24}. H. E. Gove and H. F. Stoddart. Phys. Rev. 86, 572-3(1952) May 15.

A NaI scintillation counter for detecting heavy charged particles has been built and used for measuring the angular distributions of inelastically scattered protons from targets bombarded with 7.3-Mev protons from the M.I.T. cyclotron.

Photographs of the pulse-height distribution of protons from Mg and C are shown and interpreted. The angular distributions of the inelastic proton groups corresponding to the 1.38-Mev level in Mg^{24} and the 4.45-Mev level in C^{12} have been measured with a very stable single-channel analyzer. The results are shown, and coefficients of Legendre polynomials giving the best fit to the data are tabulated. Both angular distributions are asymmetric about 90°, indicating that at least two levels of different parity are involved in the compound nuclei (Al^{25} and N^{13}).

4244

THE ELECTRON SPECTRA PRODUCED BY A Co^{60} SOURCE IN WATER. Evans Hayward. Phys. Rev. 86, 493-5(1952) May 15.

The spectra of secondary electrons produced by a Co^{60} gamma-ray source have been measured at distances of 10, 29, 41.6, 81.6, 121.6, and 161.6 cm in a large tank of water. The pulse-height distribution representing the energy lost in an anthracene crystal was determined for each separation of detector and source. The shape of the spectrum was found to change appreciably with distance. The results agree remarkably well with theoretical predictions. (auth)

4245

ON THE THEORY OF MULTIPLE SCATTERING OF CHARGED PARTICLES. G. Molière and F. Sauter. Z. Naturforsch. 7a, 280-2(1952) Mar.-Apr. (In German)

Several complementary and clarifying remarks on the paper by Sauter and Wanke (Z. Naturforsch. 7a, 33(1952); NSA 6-2512) are presented.

RADIATION EFFECTS

4246

SOME OBSERVATIONS OF LUMINESCENCE OF ALKALI HALIDE CRYSTALS SUBJECTED TO IONIZING RADIATION. J. A. Ghormley and H. A. Levy. J. Phys. Chem. 56, 548-54(1952) May

Luminescence phenomena of some alkali halides subjected to ionizing radiation under a variety of conditions have been measured and interpreted on an elementary level in terms of trapped electrons and positive holes. The observations include fluorescence and phosphorescence (primarily glow curves for thermoluminescence) and spectral distribution of the emitted light in the range 2300 to 12,000 A. Infrared emission has been observed from γ-irradiated and additively colored potassium chloride during the exposure to F-band light. This emission is interpreted as associated with a transition from the excited state of F-centers to their ground state. Glow curves for infrared emission during heating of additively colored potassium chloride following exposure at low temperatures to F-band light exhibit five peaks between –196 and +25°C, indicating five types of electron traps. Glow curves obtained simultaneously for different emission bands indicate that at least two types of processes requiring activation energy may occur, and a single type of activation step can lead to more than one spectral emission band. Sodium chloride and lithium fluoride crystals irradiated at 4°K, and allowed to warm give maximum emission at 66 and 135°K, respectively, with little phosphorescence below these temperatures. These emission peaks are thought to arise from release of self-trapped electrons. A temperature-independent afterglow observed in alkali halides is attributed to tunnelling of trapped electrons to trapped holes. (auth)

RADIOACTIVITY

4247

Engineering Research Inst., Univ. of Mich.

PROGRESS REPORT TO JANUARY 1, 1952; INVESTIGATION OF NUCLEAR-ENERGY LEVELS, by J. M. Cork. [nd] 44p. (NP-3787)

A survey of the decay schemes of the radioisotopes of Hf is given. The isotopes considered are Hf^{175}, Hf^{179}, Hf^{180}, and Hf^{181}. The energy levels of Lu^{175} and Ta^{181} are given. Tabulated results are given of the electron energies in Hf^{175}, Hf^{179}, and Hf^{180}. Nine reprints on other radioisotopes from Phys. Rev. (1951) and one from Nucleonics (1950) are included.

4248

Radiation Lab., Univ. of Calif.

INVESTIGATIONS OF COMPLEX STRUCTURE IN ALPHA EMISSION WITH NUCLEAR EMULSIONS, by Dean C. Dunlavey and Glenn T. Seaborg. Apr. 25, 1952. 5p. (UCRL-1783)

The conversion electrons accompanying α emission for Cm^{242}, Am^{241}, Pu^{238}, Pu^{236}, Np^{237}, U^{238}, U^{236}, U^{232}, Th^{232}, and Sm^{147} are reported. The conversion electrons were identified in Ilford G-5 nuclear emulsions. Energies of the electrons were approximated from their range and these energies, together with postulation of the shell of conversion (or binding energy) of the electrons, allows calculation of the γ-ray energy or nuclear energy level separation. The percentage of α particles having such conversion electrons associated with them represent a lower limit to the α decay leading to the corresponding nuclear energy level since the unconverted γ rays are not measured by this technique.

4249

Radiation Lab., Univ. of Calif.

THE SPECIFIC ALPHA ACTIVITIES AND HALF-LIVES OF U^{234}, U^{235}, AND U^{236} (thesis), by Edward Homer Fleming, Jr. June 1952. Decl. with deletions May 19, 1952. 59p. (AECD-3395; UCRL-1788)

The specific alpha activities and half lives of U^{234}, U^{235}, and U^{236} have been determined. The material used for each determination was uranium very highly enriched in the isotope under investigation. Accurate volume aliquots of U^{235} were electrodeposited quantitatively onto platinum disks and were counted in a medium geometry chamber. Accurate weight aliquots of U^{234} and of U^{236} were pipetted onto platinum disks, evaporated to dryness in an induction furnace, and counted in a medium-geometry chamber. The specific activities and half lives found are as follows:

Isotope	(d/min/mg)	(years)
U^{234}	$1.370 \pm 0.009 \times 10^7$	$2.475 \pm 0.016 \times 10^5$
U^{235}	$4.74 \pm 0.10 \times 10^3$	$7.13 \pm 0.16 \times 10^8$
U^{236}	$1.406 \pm 0.011 \times 10^5$	$2.391 \pm 0.018 \times 10^7$

(auth)

4250

Argonne National Lab.

DECAY SCHEME OF $_{21}Sc^{48}$, by Dieter Kurath. May 1952. 2p. (AECU-2049; UAC-568)

From theory the spin of Sc^{48} is expected to be 6 or 7. The decay scheme of Sc^{48} shows an allowed β decay followed by 2 gammas in cascade. The fact that the decay is allowed is not consistent with the assignment of 6 or 7 for the spin. Recent measurements of the masses of Ca^{48} and Ti^{48} give a difference in mass of 4.29 ± 0.15 Mev, which means that if the decay scheme of Sc^{48} is correct, Ca^{48} should be unstable to β^- decay to Sc^{48} with an energy of 1.35 ± 0.2 Mev. A search for β decay lead to negative results with a lower limit of 2×10^{16} years for the lifetime. Some observations on this puzzling fact are given.

4251

Notre Dame Univ.

RADIOACTIVITY PRODUCED IN PLATINUM BY SLOW NEUTRON CAPTURE, by Barun C. Haldar. [nd] 7p. (AECU-2059)

The radioactivity produced in Pt by slow neutrons from the Oak Ridge pile is composite in character. The decay

curve followed after 40 hr from the end of bombardment, resolves into three components of half lives 19 hr, 4.4 days and 73 days. Al absorption curves indicate that the maximum energy of the β particles associated with the 73-day activity is the same as that of β particles from 19-hr activity. It is quite possible that the 73-day activity is a nuclear isomer of the 19-hr activity which is assigned to the mass number 197. (auth)

4252

Argonne National Lab.

GAMMA RAYS FROM Sc^{48}, by Bernard Hamermesh, Virginia Hummel, Leonard Goodman and Donald Engelkemeir. May 1952. 3p. (AECU-2053; UAC-571)

Titanium metal was bombarded with 14-Mev neutrons, and the sample was studied with a NaI crystal spectrometer. The decay was followed for several days, and after sufficient time had elapsed for the 3-hr Ti^{45} to decay, the pulse height distribution due to the 44-hr activity was obtained. The resulting curve is presented. The three peaks are located at 1.33 Mev, 0.980 Mev, and 0.695 Mev. The true intensity ratio between the peaks at 0.980 and 1.33 is discussed.

4253

THE DECAY OF RUBIDIUM 87. M. H. MacGregor and M. L. Wiedenbeck. Phys. Rev. 86, 420-1(1952) May 1.

The half life of Rb^{87} has been investigated by means of the cell counter described by Sawyer and Weidenbeck (Phys. Rev. 79, 490(1950)). A thin aluminized zapon film upon which RbCl was vaporized served as the cathode. Data are plotted for various source-plus-backing thicknesses. The specific activity extrapolated to zero thickness was 478 counts/g RbCl/sec; this, combined with Nier's value for the isotopic abundance, gives $T_{1/2} = 6.23 \pm 0.3 \times 10^{10}$ years. An investigation was then carried out to determine whether or not there are coincidences between β particles and conversion electrons. The coincidence curve for the thinnest source closely resembles that for S^{35}, and it is concluded that the Rb^{87} disintegration consists of a simple β decay.

4254

β-DECAY OF MIRROR NUCLEI AND THE SHELL MODEL. O. Kofoed-Hansen and Aage Winther. Phys. Rev. 86, 428-30(1952) May 1.

For mirror nuclei experimental ft values agree within a factor of two with the theoretical nuclear matrix elements for suitably chosen β-decay coupling constants. It is the purpose of the present note to base a determination of these coupling constants on those mirror nuclei which have closed shells (0,2,8,20) in both neutrons and protons ± one particle. Plots of B vs. x, where $B = ft\,[(1-x)|F|^2 + x|G|^2]$ and x is the relative contribution from G-T coupling, for all the transitions considered are shown to pass, within experimental uncertainties, through the point $x = 0.50 \pm 0.05$, $B = 2600 \pm 85$, yielding $g = 2.19 \pm 0.03 \times 10^{-49}$ erg cm^3. $|F|^2$ and $|G|^2$ were also calculated for mirror nuclei having 6 or 16 protons and neutrons ± one particle; the data are tabulated. Results for unique J-T multiplet mirror nuclei are also given.

4255

ENERGY AVAILABLE FOR DOUBLE BETA-DECAY OF Sn^{124}. Benjamin G. Hogg and Henry E. Duckworth. Phys. Rev. 86, 567(1952) May 1.

The energy available for double β decay of Sn^{124} has been measured with a mass spectrograph. The Sn^{124}-Ni^{62} and Te^{124}-Ni^{62} doublets, photographed at mass number 62, yield the following mass differences: $\frac{1}{2}Sn^{124}$-$Ni^{62} = 0.02378 \pm 12$ amu and $\frac{1}{2}Te^{124}$-$Ni^{62} = 0.02297 \pm 19$ amu. The Sn^{124}-Te^{124} mass difference is, therefore, 0.00162 ± 44 amu, or 1.5 ± 0.4 Mev. This value gives a lower limit for the lifetime of the Sn^{124} double β decay of $2.1 \pm 0.3 \times 10^{17}$ years.

4256

THE RADIOACTIVE DECAY OF RUTHENIUM 103. J. M. Cork, J. M. LeBlanc, F. B. Stumpf, and W. H. Nester. Phys. Rev. 86, 575-6(1952) May 15.

By means of photographic spectrometers several previously unreported γ rays have been found in the decay of Ru^{103}. A decay scheme is proposed whereby Ru^{103} decays as follows: (1) 210-kev β accompanied by 498.5-(E2) and 39.6-kev (E3) γ rays, and (2) 695-kev β accompanied by 52.9-kev(E2) γ. A 610-kev γ (E4) was also found, indicating that a 137-kev β may have been overlooked. The following energy levels in Rh^{103} are suggested: ground ($\pm\frac{1}{2}$), 57-min 40 kev ($\pm\frac{1}{2}$), 53 kev ($\pm\frac{5}{2}$), 538 kev ($\pm\frac{3}{2}$), and 611 kev ($\pm\frac{3}{2}$).

4257

X AND γ RADIATION EMITTED BY POLONIUM-210. Michel Riou. J. phys. radium 13, 244(1952) Apr. (In French)

Between 15 and 4000 kev, Po^{210} was found to emit only a single γ ray of 800-kev energy, which is internally converted with emission of Pb K rays with an intensity of $1.6 \pm 0.5 \times 10^{-6}$ photons/α particle. Pb L rays with an intensity of $2.2 \pm 0.5 \times 10^{-4}$ photons/α were found to arise through α-particle excitation of Pb present in the source, not through γ conversion. The internal-conversion coefficient in the K shell is 10 ± 3 %, indicating electric multipole radiation with 2^4 or 2^5 polarity.

4258

SIMPLE EMANATION METHOD FOR PREPARATION OF PURE RADIOLEAD AND RADIOBISMUTH SOLUTIONS. E. Broda, H. Fabitschowitz, and T. Schönfeld. Monatsh. 83, 482-6(1952) Apr. 15. (In German)

A stream of air sweeps the 54.5-sec Tn (Ra^{220}) from a concentrated $Th(NO_3)_4$ solution into pure H_2O, providing an extremely dilute but pure solution of 10.6-hr ThB (Pb^{212}) and 1-hr ThC (Bi^{212}). Dependence of yield on air-stream velocity is discussed.

4259

THE DECAY ENERGY OF Si^{31}. A. H. Wapstra. Phys. Rev. 86, 561-2(1952) May 15.

The endpoint of the Si^{31} β spectrum was measured by absorption in Al as 1.53 ± 0.04 Mev. The β spectrum was also measured in an intermediate-image spectrometer, the mean endpoint of two good runs being 1.486 ± 0.012. From the latter value of the disintegration energy and the Q values of the (d,p) reactions on the three Si isotopes, P^{31}–Si^{32} was found to be 26.380 ± 0.020 Mev.

4260

GAMMA TO POSITON RATIO OF COPPER 64. H. T. Vlaar and A. H. W. Aten, Jr. Physica 18, 275-6(1952) Apr. (In English)

Absorption experiments in Pb, with careful comparison of the absorption of N^{13}, F^{18}, Co^{60}, and Na^{22} radiations, have led to the value 0.023 for the γ/β^+ ratio of Cu^{64}. The probable error is about 0.004.

4261

THE DECAY ENERGY OF Pb^{209}. A. H. Wapstra. Phys. Rev. 86, 562(1952) May 15.

An unsuccessful attempt has been made to explain the 0.4-Mev discrepancy between the maximum energy of the Pb^{209} β spectrum and the decay energy of Pb^{209} computed from a closed energy cycle. It appears that the discrepancy cannot be explained by the formation of a long-lived isomeric state in Bi^{209} or by the presence of γ rays. No conversion lines with energy >30 kev and intensity >2% of the β spectrum were found. From measurements of absorption of the Pb^{209} β particles in Al, the maximum β energy was found to be 0.64 ± 0.03 Mev. Measurements with an intermediate-image β spectrometer yielded the value 635 ± 10 kev.

4262
ON THE CHARGE OF THE RECOIL ATOM IN THE β-DECAY OF He^6. Aage Winther. Kgl. Danske Videnskab. Selskab, Mat.-fys. Medd. 27, No. 2(1952). (In English)

The wave function for the 1 s ns ($n \geq 2$) states of Li II is derived in section 2 of this report. The expansion coefficients are evaluated in section 3, and the results obtained are compared in section 4 with approximate direct estimates of the transition to free states, including the virtual states. In section 5 consideration is given to various minor effects neglected in previous sections. A few remarks are also made concerning the ionization by β decay in heavier atoms.

4263
GAMMA-RADIATIONS FROM 36.5-HR Rh^{105g}. G. E. Boyd. Phys. Rev. 86, 578(1952) May 15.

Purified RuO_2 was irradiated with slow neutrons and the Rh formed was separated out. The γ spectrum of 36.5-hr Rh^{105} showed photolines at 322 ± 5, 157 ± 5 (very weak), and possibly at 80 ± 5 kev. Energy-dependent β-γ coincidences were also observed. Absorption of the coincidences in Al gave a range of 63 mg Al/cm^2 corresponding to a maximum β energy of ~260 kev. The coincident γ had an energy of 320 kev, with 10 ± 2% of the 36.5-hr Rh^{105} disintegrations proceeding through the 320-kev γ. The Rh^{105} ground state is probably $+\frac{7}{2}$ and the Pd^{105} 320-kev level $g_{7/2+}$.

4264
RADIOACTIVE MATERIAL IN THE ATMOSPHERE. K. B. Dawson. Brit. J. Cancer 6, 22-31(1952) Mar.

Measurements of the radioactivity of the suspended matter in the air have been carried out in London at three sites, in Manchester, and in the country at Rothamsted. The amounts show no considerable difference between urban and rural districts, but there are large day-to-day variations which in situations out of doors are affected chiefly by the wind; the more stationary the air, the greater the activity. In closed places, e.g., an air-raid shelter underground, the amount may be 100 or more times greater than those in the street outside, but even these are small in comparison with the lowest amounts considered harmful to man. (auth)

4265
INTERNAL CONVERSION OF THE 0.411-MEV GAMMA-RAY OF Hg^{198}. Lennart Simons. Phys. Rev. 86, 570(1952) May 15.

It is pointed out that the experimental value $\alpha_K = 0.0307$ obtained by Cavanagh (Phys. Rev. 82, 791(1951)) for the K-conversion coefficient of the 0.411-Mev γ ray of Hg^{198} agrees exceptionally well with the theoretical value $\alpha_K = 0.031$ obtained by interpolation of the coefficients of Rose et al. (Phys. Rev. 83, 79(1951)) for E4 radiation. It is concluded that the 0.411-Mev γ ray of Hg^{198} is pure E4.

4266
498-KEV GAMMA-RAY OF Ru^{103}. Arthur W. Knudsen. Phys. Rev. 86, 571(1952) May 15.

The energy of the 498-kev γ of Ru^{103} has been measured as 497.9 ± 0.8 kev. A double-focusing β spectrometer was used to measure the difference in energy between the K-level photoelectric lines of U produced by γ rays from the Ru and by positron-annihilation radiation.

4267
THE RE-INVESTIGATION OF SOME PHOTOELECTRON LINES OF THORIUM (B + C) [MIXTURE OF Pb^{212} and Bi^{212}]. D. A. Silverston. Proc. Phys. Soc. (London) A65, 344-9 (1952) May.

The β-ray spectrum of thorium (B + C) [Pb^{212} and Bi^{212} mixed] has been re-investigated using the β-ray spectrograph described by Siday and Silverston. The range 200 kev to 300 kev was studied in detail using photographic recording and a previously unobserved γ ray of energy 294.6 kev has been attributed to the transition thorium C – C″(Bi^{212} – Tl^{208}). The conversion lines of the γF ray of thorium B – C (Pb^{212} – Bi^{212}) in the L_I, L_{II} electronic shells have been resolved and their relative intensities have been found using a Geiger counter. The conversion of the same γ ray in the M_I, M_{II} electron shells has been measured and the lines have been partially resolved. The M photoelectron line associated with the transition thorium C″ – D(Tl^{208} – Pb^{208}) has been examined, and its suspected doublet structure confirmed. (auth)

4268
THE DISINTEGRATION SCHEME OF K^{40}. M. Paganelli and G. Quareni. Phys. Rev. 86, 423-4(1952) May 1.

An attempt has been made to prove that the γ ray in the decay of K^{40} is associated with the K capture. Geiger counters having the cathodes internally coated with a layer of a K salt were surrounded by ordinary counters in triple- and double-coincidence arrangements. The number of double coincidences was found to vary with the chemical composition of the K salt but not with the mass of K. The results are in agreement with the hypothesis that there is an association between the γ radiation and the Auger electrons. The increase in coincidences observed with KF-coated counters filled to a higher pressure agrees with the hypothesis that a fraction of the coincidences are due to γ radiation and x rays following K-capture.

4269
THE GAMMA-RADIATIONS FROM V^{48} AND Nb^{92}. Harold K. Ticho, David Green, and J. Reginald Richardson. Phys. Rev. 86, 422(1952) May 1.

The γ radiations emitted during the decay of a V^{48} sample have been studied with a Hofstadter-type NaI spectrometer. Microdensitometer traces of the spectra of Na^{22}, V^{48}, and Na^{24} were compared in order to evaluate the high-energy V^{48} line. The result gave a spread of <1% and may be stated as 2.22 ± 0.02 Mev. This line is not a cross-over line which would involve the sum of the 0.990-Mev and 1.320-Mev energies. The number of 2.22-Mev quanta is 3.6% of the 1.32-Mev quanta. The upper limit to the number of cross-over γ rays of 2.31 Mev can be set at 0.5% of the number of 1.32-Mev quanta. Nb^{93} was bombarded by 20-Mev protons and chemical separation was performed. The spectrum indicated the presence of two lines, one very intense line with an energy of 0.933 ± 0.009 Mev and one weak line of energy 1.84 ± 0.02 Mev. The decay of the 0.93-Mev line was consistent with the 10-day half life of Nb^{92} but the 1.84-Mev line should probably be assigned to the 42-day isomer of Nb^{93} produced by $Nb^{93}(p,p)Nb^{93*}$.

4270
RADIOACTIVITY IN NEUTRON ACTIVATED PLATINUM, J. M. Cork, J. M. LeBlanc, F. B. Stumpf, and W. H. Nester. Phys. Rev. 86, 415-16(1952) May 1.

Electron-conversion lines observed in pile-irradiated Pt have been identified with the following γ rays: 129.8 and 99.1 kev in Pt^{195} following Au^{195} decay (the 228.9-kev level in Pt^{195} has a 4.4-day half life); 191.2 and 77.4 kev in Au^{197} accompanying decay of Pt^{197} (and also decay of Hg^{197}); and 49.8, 158.5, and 208.3 (cross-over) kev in Hg^{199} accompanying decay of Au^{199}. In the 129.8-kev isomeric transition in Pt^{195} the intensity of the L_3 conversion is about equal to that for the L_1 line.

4271
TWO CASES OF ISOMERISM IN PALLADIUM. A. Flammersfeld. Z. Naturforsch. 7a, 296-7(1952) Mar.-Apr. (In German)

Two new Pd isomers are described. A 4.8 ± 0.1-min activity with conversion electrons of 0.160-Mev and γ radiation is assigned to either Pd^{107m} or Pd^{109m}. Its internal-conversion coefficient $N_e/N_\gamma \approx 0.6$, and it may be produced by the Ag(n,p), Pd(n,2n), and Pd(n,γ) reactions, the cross

section for the last being 0.018×10^{-24} cm^2 with thermal neutrons. A 23 ± 2-sec activity with 0.200-Mev conversion electrons and $N_e/N_\gamma \approx 0.4$, produced by Pd(n,2n) and Pd(n,n) reactions is assigned tentatively to Pd^{105m}. Both isomers are considered to have $\Delta I = 3$ with parity change.

4272
GERMANIUM-75, A NEW NUCLEAR ISOMER OF 42-SEC HALF LIFE. A. Flammersfeld. Z. Naturforsch. 7a, 295 (1952) Mar.-Apr. (In German)

The isomer Ge^{75m} was produced by irradiation of Ge with moderated or unmoderated Be + D neutrons, and confirmed by the (n,p) process on As. The half life is 42 ± 2 sec, only γ rays and conversion electrons (in 1 : 2 ratio) of 0.14-Mev energy are emitted, and the cross section for production from the natural isotopic Ge mixture is 0.06×10^{-24} cm^2. The isomer is concluded to be of class E3 ($\Delta I = 3$ with parity change).

4273
NEUTRINO RECOILS FOLLOWING THE CAPTURE OF ORBITAL ELECTRONS IN A^{37}. George W. Rodeback and James S. Allen. Phys. Rev. 86, 446-50(1952) May 15.

The energy spectrum of the recoil nuclei resulting from orbital-electron capture in A^{37} has been determined by a time-of-flight measurement of the recoil ions. A^{37} disintegrations occurred within a gas-filled source volume, where the total pressure was approximately 10^{-5} mm Hg. The time-of-flight distribution, as measured by a multichannel delayed-coincidence technique, has a definite maximum time limit. Furthermore, the shape and extent of the distribution correspond to that expected from monoenergetic recoils, originating in an extended source and having an energy of 9.7 ev as predicted by the single-neutrino hypothesis. Zero and short time coincidences were observed in addition to the above distribution. Further measurements indicate these to be the result of electron scattering associated with A^{37} decays not originating in the source volume. (auth)

4274
THE INTERPRETATION OF IMAGE TRANSITIONS IN BETA-DECAY THEORY. George L. Trigg. Phys. Rev. 86, 506-12(1952) May 15.

The allowed favored beta transitions are studied in relation to problems of nuclear structure and beta-decay theory. These problems include (1) the influence of deviations from L-S coupling on the beta-decay matrix elements of the light nuclei, (2) the relation between the observed magnetic moments, simple nuclear models and deviations from L-S coupling, (3) determination of the ratio of Fermi to Gamow-Teller type coupling constants, and (4) determination of the absolute magnitudes of the coupling constants. The analysis of all available data yields two mutually supporting conclusions: (a) a substantial Fermi-type component is present in the beta-decay interaction and (b) deviations from L-S coupling are an important factor in the interpretation of nuclear magnetic moments. (auth)

4275
INTERNAL-CONVERSION β SPECTRUM EMITTED IN THE TRANSMUTATION THORIUM X – THORON. Salomon Rosenblum, Manuel Valadares, and Marcel Guillot. Compt. rend. 234, 1767-9(1952) Apr. 28. (In French)

A β-ray-spectrographic study of ThX (Ra^{224}) showed the presence of four new lines of conversion electrons with energies of 30.1, 42.8, 142.2, and 226.7 kev. The visual intensities of these lines were medium, weak, strong, and medium, respectively. The last two are attributed to K and L_{III} conversions of the ThX 238-kev γ transition, which is concluded to be electric quadrupole radiation. The first two lines might be K and L conversions of a 50-kev γ ray.

4276
NEW DETERMINATION OF THE INTENSITIES OF FINE-STRUCTURE GROUPS IN THE AcC – AcC″ TRANSMUTATION. Glaphyra Vieira and Lidia Salgueiro. Compt. rend. 234, 1765-7(1952) Apr. 28. (In French)

A statistical study of 150,000 α tracks in nuclear emulsion exposed to AcC (Bi^{211}) radiations in an intense magnetic field showed that 82.6% of the disintegrations belong to the α_0 group and 17.4% to the α_1 group. The energy difference between the two groups is 353 kev, and the effective radii, calculated from Gamow's equation, are 6.20×10^{-13} and 6.53×10^{-13} cm, for α_0 and α_1, respectively.

4277
NEUTRON EMISSION BY SAMARIUM. Maurice Nahmias. Compt. rend. 234, 1763-5(1952) Apr. 28. (In French)

Since the α decay of Sm^{147} leads to a nuclide (Nd^{143}) containing 83 neutrons, emission of neutrons by a Sm sample might be expected. An attempt to observe neutron emission from 1 kg of Be-free Sm_2O_3 with BF_3 proportional counters was made, but the results were completely negative. This is contrary to the observations of Yagoda and Kaplan (Phys. Rev. 76, 702(1949)) with photographic film.

4278
ON THE INTENSITIES OF γ-RAYS OF RaC. Seizaburo Kageyama. J. Phys. Soc. Japan 7, 93-8(1952) Jan.-Feb.

The intensities of γ rays of RaC (Bi^{214}) were investigated with a semicircular focusing magnetic spectrometer and coincidence technique of G-M counters. The efficiencies of a thick radiator for γ rays of various energies were calculated according to the experimental straggling curves obtained by White and Millington, taking the scattering losses into consideration. The intensities of γ rays were determined from the maximum heights of momentum distribution curve of Compton recoil electrons projected from a thick target of aluminum. From these values and the relative intensities of conversion electrons reported earlier, the internal conversion coefficients were calculated and compared with the results of former authors, and with theoretical values. Both the intensities of γ rays of RaC and the internal conversion coefficients obtained are in accord with the results of Ellis and Aston. (auth)

SHIELDING

4279
Chemical and Radiological Labs., Army Chemical Center
TOTAL LINEAR ABSORPTION COEFFICIENTS OF VARIOUS TYPES OF MEDIA FOR GAMMA RADIATION; INTERIM REPORT, by John A. Pierce, Jr. and Paul M. James. Nov. 8, 1951. 26p. (TCIR-591)

Total attenuation coefficients for γ radiation have been determined experimentally as follows:

Absorber	(cm^{-1})
Plate glass	0.152
Concrete	0.126
Steel	0.438
Water	0.0572
Lead	0.737
Tantalum Powder (untamped)	0.525
Tantalum Sheets	0.988
Methylacrylate	0.0696
100 Octane Gasoline	0.0343
TNT	0.0924
Tritonal	0.1055

Comparison of experimental values with such values as exist in the literature, which are within the experimental energy range, confirms the reliability of the procedure employed. (auth)

SPECTROSCOPY

4280

Spectroscopy Lab., Pennsylvania State Coll.
TECHNICAL REPORT FOR THE PERIOD MAY 1, 1951 – MAY 1, 1952. [nd] 72p. (NP-3820; U22043 to U22050)

Rotational Isomerism in Symmetrical Tetrachloro and Tetrabromoethane, by R. E. Kagarise and D. H. Rank. Raman and infrared spectra of liquid 1,1,2,2-tetrachloro- and tetrabromoethane were determined with a 3-prism spectrograph of 16 A/mm dispersion at λ4500, and with a 15-ft, concave-grating spectrograph of 3.8 A/mm dispersion. Three lines of the Raman spectrum of the Br compound previously reported as singlets were resolved into doublets, enabling a complete comparison of the vibrational spectra of both compounds. The isomers are indicated to possess C_{2h} and C_2 symmetries, with the gauche form (point group C_2) being more stable than the trans form (point group C_{2h}). Spectra of the Cl-isotope effect of $CHCl_3$, CCl_4, 1,2-dichloroethane, and 1,1,2,2-tetrachloroethane supported this conclusion. The ΔH for the reaction $C_2 \rightarrow C_{2h}$ in the Br compound was 910 ± 50 cal/mole. Precision Determination of the Velocity of Light by A Band Spectrum Method, by D. H. Rank, R. P. Ruth, and K. L. Vander Sluis. The velocity of light in vacuo was assumed equivalent to the ratio of B microwave to B infrared, where $B = h/8\pi^2 I$ (h being Planck's constant and I the moment of inertia for the vibrational state). A Fabry-Perot etalon was crossed on a high-resolution, plane-grating spectrograph in combination with a multiple-reflection absorption tube. The rotational constant B_{000}'' was determined for HCN from the 004 and 103 infrared rotation-vibration bands. The ratio between this value, 1.47830 ± 0.00002 cm^{-1}, and that determined in pure frequency units in the microwave region, 44,315.9 ± 0.25 Mc, gives a value of 299,776 ± 6 km/sec for the speed of light in vacuo. Some Molecular Constants of $HC^{13}N$, by R. E. Kagarise, H. D. Rix, and D. H. Rank. The 003, 103, and 004 rotation-vibration bands of $HC^{13}N$ were observed in the photographic infrared region of the spectrum. The Raman spectrum of the liquid was obtained with sufficient dispersion to measure the isotopic shift of ν_1. The molecular constants were determined by the $\Delta_2 F$ graphical and least-mean-squares methods and by the $\Delta_+\tilde{\nu}$ and $\Delta_-\tilde{\nu}$ least-mean-squares method. Values are tabulated for B′, B″, D′, D″, α_1, and α_3; the value for B″ of 1.4400_8 (the average for the 3 bands) agrees well with the B″ of 1.4400_8 calculated from microwave data and 299,766 km/sec as the speed of light in vacuo. Error of Run in Diffraction Gratings, by D. H. Rank. An error of run was demonstrated for the Anderson plane grating which contains 15,000 lines/inch. The grating was mounted between a collimating mirror of 1000-cm focal length and a focusing mirror of 975-cm focal length. Visual tests were made with λ5461 by separating 2 of the line's most prominent satellites with 0.045A, opening the slit of the spectrograph until the satellites were just at the limit of resolution, and then calculating the purity by means of Schuster's formulas and tables. No noticeable deterioration of resolving power was apparent in the fourth-order green. The focus of the central image and the fifth-order green differed by 10.9 cm. The defect produced a marked astigmatism in the high orders but did not noticeably impair resolving power. The last line of the grating ruling was shown to be out of its mathematical position by 2.88×10^{-3} mm when compared to the first ruling. Theoretical Resolving Power of Diffraction Gratings, by D. H. Rank. The intensity distribution in the diffraction pattern produced by a grating was calculated. Resolution on the Abbe criterion was 0.873 π contrasted to π on the Rayleigh criterion. The effect of slit width on the actual resolving power of a grating according to the Abbe criterion was calculated, making use of Schuster's tables for the intensity distribution in images of slits of finite width. Spectral purities for 12 slit widths are tabulated. Synthesis of Organic Deuterium Compounds. I. Preparation of Methyl-d_3 Bromide, by E. R. Shull, T. S. Oakwood, and D. H. Rank. The following synthesis gave CD_3Br (I) and required a minimum of D_2O:

$$(COOH)_2CH_2 \xrightarrow[\text{stepwise}]{D_2O} (COOD)_2CD_2$$

$$\xrightarrow{150°C} CD_3COOD \xrightarrow{Ag_2O} CD_3COOAg \xrightarrow[\text{in light}]{Br_2/CCl_4} CO_2 + AgBr +$$

I. The final products were fractionated with a packed column, the yield of I being 83% and the b.p. 2.5 to 2.6°C. (NRS abst.) (cf. U-17714)

4281

STRUCTURE AND ZEEMAN-EFFECT IN THE SPECTRUM OF THE TANTALUM ATOM Ta I. PART II. G. J. Van Den Berg, P. F. A. Klinkenberg, and J. C. Van Den Bosch. Physica 18, 221-48(1952) Apr. (In English)

The analysis of the Ta I spectrum is continued. A few ground levels and a great number of high odd levels are found in addition to those given previously. Moreover a group of high even levels is discovered from which the ionization potential is found to be 7.77 ± 0.10 v. The total number of classified Ta I lines is now 1262, corresponding to transitions between 22 even ground levels, 182 odd levels, and 8 high even levels. All newly classified lines and Zeeman-effect data are presented. The interpretation of the detected energy levels is revised and extended. Configuration calculations concerning the low even levels, using the method of Racah, are helpful in locating and interpreting a number of them. Typical perturbations are pointed out. (auth)

4282

MICROWAVE SPECTRUM OF BrCN AT SIX MILLIMETERS. S. J. Tetenbaum. Phys. Rev. 86, 440-6(1952) May 15.

69 lines of the $J = 5 \rightarrow 6$ pure rotational spectrum have been measured. Lines were found due to the following molecules in their normal isotopic abundances; $Br^{79}C^{12}N^{14}$, $Br^{81}C^{12}N^{14}$, $Br^{79}C^{13}N^{14}$, $Br^{81}C^{13}N^{14}$, $Br^{79}C^{12}N^{15}$, and $Br^{81}C^{12}N^{15}$. Transitions have been found in the vibrational states (0 0 0), (0 1^1 0), (1 0 0), (0 2^0 0), (0 2^2 0), and (1 1^1 0). The apparatus is described and experimental results are compared with those of previous investigators. Fermi resonance effects have been observed and analyzed. A dependence of the l-type doubling constant on the bromine quadupole field has been found. Quadrupole coupling constants have been determined for the first excited vibrational states in $Br^{79}C^{12}N^{14}$ and $Br^{81}C^{12}N^{14}$. (auth)

THEORETICAL PHYSICS

4283

Nuclear Physics Lab., Case Inst. of Tech.
THE ELECTROMAGNETIC PROPERTIES OF DIRAC PARTICLES, by L. L. Foldy. [nd] 19p. (AECU-2027; Technical Report No. 14)

A framework for describing those electromagnetic properties of Dirac (spin ½) particles which determine their behavior when moving with low momentum through weak slowly varying external electromagnetic fields is developed by finding the most general interaction terms which may be added to the Dirac equation for the particle subject to appropriate conditions. The interaction terms found form an infinite series involving arbitrarily high derivatives of the electromagnetic potentials evaluated at the position of the particle. The series of coefficients of these terms then characterize the properties to be described and can be interpreted as a series of moments of the charge and current distribution associated with the Dirac particle. The first coefficient represents the charge of the particle,

the second its anomalous magnetic moment. The third is a measure of the spatial extent of the particle's charge distribution, and the corresponding term describes a direct interaction of the particle and the charge distribution responsible for the external electromagnetic field. Higher terms in the series describe direct interactions of the particle with various derivatives of the external charge and current distribution. The correct physical interpretation of the terms is examined by transforming to the Foldy-Wouthuysen (nonrelativistic) representation of the Dirac equation. The consistency of the framework developed with field-theoretical results is discussed. Limitations of the characterization derived here and the possibilities of broadening the assumptions on which it is based are examined. The results are applied in the succeeding paper (AECU-2028) to the interpretation of the electromagnetic properties of nucleons with particular reference to the electron-neutron interaction. (auth)

4284
THE VIRIAL THEOREM FOR A DIRAC PARTICLE. M. E. Rose and T. A. Welton. Phys. Rev. 86, 432-3(1952) May 1.

The authors have recently had occasion to use a number of identities, satisfied by Dirac wave functions, which take the form of a virial theorem in the relativistic quantum case. In the hope that these results may prove useful to others they are communicated in the present note.

4285
A PROBABILITY-THEORETICAL FOUNDATION AND INTERPRETATION OF QUANTUM MECHANICS. Imre Fényes. Z. Physik 132, 81-106(1952). (In German)

4286
A CANONICAL FORMULATION OF RELATIVITY MECHANICS AND ITS QUANTUM-THEORETICAL ANALOGUE. Gottfried Falk. Z. Physik 132, 44-53(1952). (In German)

An invariant canonical formulation of classical relativity mechanics is given. The corresponding representation in quantum mechanics leads to a theory differing in physical content from those presented to date. The problem of elementary particles appears as a necessary consequence of the theory.

4287
CONTRIBUTION TO THE THEORY OF DIRECTIONAL CORRELATION. Kurt Alder. Helv. Phys. Acta 25, 235-58 (1952) Apr. 30. (In German)

The theory of angular correlation of emission of successive particles by an excited nucleus, particularly its mathematical aspects, is discussed. Appendixes list group-theoretical relations and Racah, interference, and Clebsch-Gordon coefficients.

4288
REPRESENTATION OF SYSTEMS OF IRREDUCIBLE WAVE EQUATIONS IN THE THEORY OF PARTICLES OF ARBITRARY SPIN. APPLICATION TO CALCULATION OF SCATTERING CROSS SECTIONS. Gérard Petiau. Compt. rend. 234, 1955-7(1952) May 12. (In French)

The matrix formalism of the irreducible representations of wave equations of spin $n\hbar/2$ particles is obtained by introduction of a suitable operator derived from L. de Broglie's fusion method. The equations are applied to evaluation of the cross sections for scattering between particles of various spins.

4289
MASS STABILITY OF THE ELECTRON IN LINEAR GENERALIZATIONS OF CLASSICAL ELECTRODYNAMICS. H. Steinwedel. Z. Naturforsch. 7a, 205-6(1952) Feb. (In German)

4290
SPONTANEOUS LIGHT EMISSION IN UNITARY QUANTUM ELECTRODYNAMICS. G. Süssmann. Z. Physik 131, 629-62 (1952). (In German)

Ludwig's quantization (Z. Naturforsch. 5a, 637(1952); NSA 5-3566) of the Wheeler-Feynman electrodynamics (Revs. Modern Phys. 17, 157(1945); 21, 425(1949)) on the basis of a simple absorber model was extended with calculation of Einstein's coefficient; the accepted value was found. For this purpose the radiation field emitted by the absorber was determined in the first approximation of Dirac's perturbation method. In addition, electron states in which "light quanta" definitely exist were found.

4291
DOES THE NEUTRINO REALLY EXIST? S. M. Dancoff. Bull. Atomic Scientists 8, 139-41(1952) June.

A philosophical discussion on the existence of the neutrino is given. The article concludes that the neutrino appears to be an appropriate concept on the basis of all experiments performed to date relating to Fermi's theory. As to whether it is something more, something real in some sense or other, it doesn't appear possible to define that question in a physically meaningful way.

4292
ADVANCED AND RETARDED SOLUTIONS OF GENERALIZED FIELD EQUATIONS. H. Lehmann and H. Steinwedel. Z. Naturforsch. 7a, 204-5(1952) Feb. (In German)

4293
CALCULATION OF CROSS SECTIONS FOR SCATTERING OF PARTICLES WITH SPINS 0, $\hbar/2$, AND $\hbar$ BY A SCALAR OR PSEUDOSCALAR MESON FIELD. Gérard Petiau. Compt. rend. 234, 1749-51(1952) Apr. 28. (In French)

Expressions are derived for the covariant calculation of cross sections for scattering between two particles coupled by a scalar or pseudoscalar field and having any combination of spins 0, ½, or 1.

4294
HOW CAN THE UNITARY FIELD THEORY EXPLAIN RADIATION EMISSION, SELF-ENERGY, AND LAMB SHIFT? Günther Ludwig. Z. Naturforsch. 7a, 248-50(1952) Mar.-Apr. (In German)

The fundamental idea that in the unitary field theory the effects of radiation emission by an atom and the Lamb shift arise from the absorber is developed. An electron alone in the universe would possess no self-energy; the presence of the absorber causes this effect. It is probable that with exact validity of the Maxwell equations even this theory would exhibit divergencies.

4295
THE ANALOGY BETWEEN THE HAMILTON-JACOBI THEORY AND QUANTUM-MECHANICAL EIGENVALUE PROBLEMS. Gottfried Falk. Z. Physik 131, 470-80 (1952). (In German)

Analogies developed axiomatically between classical and quantum mechanics (Z. Physik 130, 51(1951)) are extended to the use of the usual calculation method (separation of variables). A method developed by Lie for determination of integrals of systems of hamiltonian differential equations permits this practical procedure to be incorporated in quantum theory.

4296
THE PROBLEM OF THREE BODIES IN QUANTUM MECHANICS. Sudhansu Datta Majumdar. Z. Physik 131, 528-37(1952). (In English)

The implications of Wigner and Breit's method of reducing the number of independent variables in Schroedinger's equation for N interacting particles from 3N to 3N − 6 by the use of the integrals of motion are worked out in greater detail. It is pointed out briefly how this method can be used to calculate the wave functions and term values of He with high precision. Although the discussions strictly are confined to a system of three particles, most of the results can be extended to a system consisting of any number of par-

ticles. Incidentally, some interesting properties of the wave functions for the symmetrical top have been found. (auth)

URANIUM AND URANIUM COMPOUNDS

4297

MAGNETIC SUSCEPTIBILITIES OF EUROPIUM SESQUIOXIDE AND OF URANIUM DIOXIDE AT LOW TEMPERATURES. B. M. W. Trapnell and P. W. Selwood. Nature 169, 840-1 (1952) May 17.

The magnetic susceptibility of UO_2 at low temperatures is investigated and recorded. At 20°K, UO_2 shows no indication of a magnetic anomaly corresponding to an antiferromagnetic Curie point. The plot of reciprocal susceptibility vs. temperature is a straight line from 20 to 300°K.

4298

THE HEAT CAPACITIES OF URANIUM, URANIUM TRIOXIDE, AND URANIUM DIOXIDE FROM 15°K to 300°K. W. M. Jones, Joseph Gordon, and E. A. Long. J. Chem. Phys. 20, 695-9(1952) Apr.

Heat capacity measurements have been made over the temperature range 15 to 300°K for uranium metal, uranium trioxide, and uranium dioxide. A maximum was observed at 28.7°K in the heat capacity curve of UO_2 which is probably the result of the changing population of the magnetic quadrivalent uranium ions among their available energy states. The entropies of these substances at 298.16°K are 12.03, 23.57, and 18.63 cal deg^{-1} $mole^{-1}$, respectively. The free energies of formation of UO_3 and UO_2 are -273.1 ± 3 and -246.6 ± 0.6 kcal $mole^{-1}$, respectively. (auth)

PATENTS

CHEMISTRY

4299

URANIUM-AROYL ALDEHYDE COMPLEXES AND METHOD OF MAKING SAME. H. I. Schlesinger and H. C. Brown (to U. S. Atomic Energy Commission). U. S. Patent 2,596,047, May 6, 1952.

This patent describes certain new and useful chelate compounds of uranium with aroylaldehydes and methods for synthesizing the same. Illustratively uranous tetrabenzoylacetaldehyde may be prepared by treating an aqueous solution of uranous chloride with an aqueous solution of sodium benzoylacetaldehyde. The water-insoluble complex uranium salt may be recovered and purified.

4300

FLUORINATED COMPOUNDS AND PROCESS OF PRODUCING SAME. P. E. Weimer (to U. S. Atomic Energy Commission). U. S. Patent 2,596,084, May 6, 1952.

This patent covers certain perfluorinated compounds suitable for use as lubricants which are obtained from aromatic hydrocarbon derivatives. The perfluorinated oil is obtained by subjecting a polyalkyl condensation product, of a 2- to 4-carbon alkyl group with a di-nuclear aromatic hydrocarbon, to substitutive and additive fluorination by reacting vapors of said condensation product with a metal polyfluoride such as silver difluoride or cobalt trifluoride at temperatures of 200 to 400°C.

4301

COPOLYMERS OF PERFLUOROPROPENE AND TETRAFLUORETHYLENE AND METHOD OF MAKING SAME. W. T. Miller (to U. S. Atomic Energy Commission). U. S. Patent 2,598,283, May 27, 1952.

A high-molecular-weight solid perfluorocarbon is obtained by copolymerizing perfluoropropene, 9 parts, and tetrafluoroethylene, 1 part, in the presence of trichloroacetyl peroxide at a temperature in the range of 0°C.

4302

REARRANGEMENT OF SATURATED HALOCARBONS. W. T. Miller and E. W. Fager (to U. S. Atomic Energy Commission). U. S. Patent 2,598,411, May 27, 1952.

In a process for preparing saturated perhalocarbons containing at least two carbon atoms, two fluorine atoms, and two different halogens the rearrangement is accomplished by heating the starting perhalocarbon at a temperature above its melting point and between about 0°C and 95°C, with anhydrous aluminum chloride or the like for a period between one and seven hours.

4303

METHOD OF IDENTIFYING RADIOACTIVE COMPOUNDS. A. J. Dempster (to U. S. Atomic Energy Commission). U. S. Patent 2,599,166, June 3, 1952.

This patent covers a method for identifying the constituents of a radioactive mixture by first separating them in accordance with their charge-to-mass ratio by mass spectrography, and then separately measuring the radiation characteristic of each mass deposit to positively identify the same.

4304

PREPARATION OF ALUMINUM BOROHYDRIDE. H. I. Schlesinger and C. B. Brown (to U. S. Atomic Energy Commission). U. S. Patent 2,599,203, June 3, 1952.

A process for preparing aluminum borohydride comprises reacting an alkali-metal borohydride, such as sodium or lithium borohydride, with an anhydrous aluminum halide, such as aluminum chloride or aluminum bromide, by heating the mixture of reactants first to about 60°C then to about 100°C in an inert atmosphere and distilling aluminum borohydride from the reaction mass.

4305

DECOMPOSITION OF COMPLEX METAL PHOSPHATE SALTS. D. M. Gruen and J. J. Katz (to U. S. Atomic Energy Commission). U. S. Patent 2,599,326, June 3, 1952.

In recovering titanium subgroup values from a phosphorous oxychloride complex of said metal, the complex is first reacted with a monohydric alcohol containing less than five carbon atoms, then treated with water to dissolve the reaction mass, following which the metal value is precipitated as the hydroxide by addition of a source of hydroxyl ions.

4306

OXIDATION INHIBITORS OF U_3O_8. I. Sheft and S. M. Fried (to U. S. Atomic Energy Commission). U. S. Patent 2,599,946, June 10, 1952.

This process for inhibiting oxidation of U oxides wherein the valence of the U atom is less than six comprises intimately mixing about 1% of Fe oxide therewith and igniting the mixture in air.

4307

URANIUM BOROHYDRIDE AND METHOD OF MAKING SAME. H. I. Schlesinger and H. C. Brown (to U. S. Atomic Energy Commission). U. S. Patent 2,600,370, June 10, 1952.

A method of producing U borohydride comprises reacting an alkali metal borohydride with an anhydrous U tetrahalide, and recovering the U borohydride.

MINERALOGY, METALLURGY, AND CERAMICS

4308

QUATERNARY BISMUTH ALLOY. O. N. Carlson and H. A. Wilhelm (to U. S. Atomic Energy Commission). U. S. Patent 2,595,924, May 6, 1952.

This low-melting-point quaternary bismuth alloy consists substantially of from 55 to 65% bismuth, from 19 to 22% lead, from 17 to 18% tin, and 3 to 5% thallium.

4309
QUATERNARY BISMUTH ALLOY. O. N. Carlson and H. A. Wilhelm (to U. S. Atomic Energy Commission). U. S. Patent 2,595,925, May 6, 1952.

This low-melting-point quaternary bismuth alloy consists substantially of from 35 to 55% of bismuth, 15 to 40% of lead, 15 to 35% of tin, and 3 to 10% of gallium.

PHYSICS

4310
ION GAUGE MOUNTING. C. B. Proudfoot (to U. S. Atomic Energy Commission). U. S. Patent 2,594,212, Apr. 22, 1952.

This ion-gage mounting is compact, easy to build, readily disassembled for cleaning or repair, and so designed that extraneous oscillating regions are avoided.

4311
THERMAL FLOWMETER. E. T. Booth, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,594,618, Apr. 29, 1952.

This thermal flowmeter of high sensitivity is distinguished by readings that are primarily a function of the mass flow rate.

4312
FLOWMETER. C. Mannal (to U. S. Atomic Energy Commission). U. S. Patent 2,594,668, Apr. 29, 1952.

In this flowmeter, capable of accurately measuring small flows of gas, the gas to be metered is passed through a capillary tube into an electrolyte. By means of suitable electrical connections the rate at which bubbles of gas are delivered from the immersed end of the capillary are counted.

4313
PHOTOMULTIPLIER TUBE CIRCUIT. L. F. Wouters (to U. S. Atomic Energy Commission). U. S. Patent 2,594,703, Apr. 29, 1952.

A photomultiplier tube circuit is described whereby, by pulsed operation to avoid deleterious overloading, the tube may be operated at voltages much higher than the normal operating voltage. This has the advantage of providing amplification through the tube so that the output may directly drive an auxillary circuit.

4314
VIEWING DEVICE FOR RADIOACTIVE MATERIALS. G. S. Monk (to U. S. Atomic Energy Commission). U. S. Patent 2,594,970, Apr. 29, 1952.

A viewing box for radioactive materials comprises an enclosed chamber including a bottom portion and a top portion, a periscopic viewer extending through the top portion, a pair of substantially parallel horizontal rollers in the chamber adapted to rotate a workpiece having a convex surface, and a third roller between the pair on a horizontal axis below and perpendicular to the axis of the pair and adapted to move a workpiece longitudinally along the pair.

4315
MAGNETIC CONTOURING SYSTEM. W. M. Powell (to U. S. Atomic Energy Commission). U. S. Patent 2,594,989, Apr. 29, 1952.

A method of contouring the flux intensity emanating from a magnetic surface comprises ascertaining continuously the flux intensity at contiguous points in a plane spaced from the surface and simultaneously making a suitable record of points of equal flux density.

4316
UNIVERSAL MANIPULATOR FOR GRASPING TOOLS. C. M. Gordon (to U. S. Atomic Energy Commission). U. S. Patent 2,595,134, Apr. 29, 1952.

This remotely actuable universal manipulator enables the operator, while located behind a protective wall, to perform mechanical operations in handling of radioactive materials.

4317
RADIATION COUNTER. J. A. Simpson, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,595,550, May 6, 1952.

This radiation counter tube of the proportional type is characterized by high sensitivity for α particles, high geometry, and high tolerance to β background. It is so constructed that a radioactive sample may be readily placed in or removed from the chamber without disassembling.

4318
PHOTOMULTIPLIER COINCIDENCE CIRCUIT. R. E. Thomas (to U. S. Atomic Energy Commission). U. S. Patent 2,595,552, May 6, 1952.

This photomultiplier coincidence circuit, for use with scintillating crystal detectors, employs a pair of separate light sources to provide a single output voltage when the excitation occurs substantially simultaneously at each tube.

4319
IONIZATION GAUGE. K. M. Simpson, W. R. Baker, and Q. A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent 2,595,611, May 6, 1952.

This electronic pressure gage is adaptable to simple electronic regulation of the ionizing current flow therein, making it possible to obtain accurate and steady pressure readings.

4320
FISSION INDICATOR. C. E. Wiegand (to U. S. Atomic Energy Commission). U. S. Patent 2,595,622, May 6, 1952.

In this method and means for indicating fission and determining fission cross sections, ionization caused by the fission fragments is indicated without interference due to ionization caused by charged particles producing the fission.

4321
IONIZATION CHAMBER. J. R. Raper and R. E. Zirkle (to U. S. Atomic Energy Commission). U. S. Patent 2,596,080, May 6, 1952.

This ionization chamber has a wall electrode having an atomic composition such as to produce ionizing particles as a result of the impingement of fast neutrons and γ rays in a manner similar to such production in human tissue. The electrode is comprised of a homogeneous mixture of about 90% methyl methacylate resin and 10% graphite.

4322
POCKET RADIATION ALARM. E. W. Molloy (to U. S. Atomic Energy Commission). U. S. Patent 2,596,500, May 13, 1952.

This light weight, pocket size, integrating radiation exposure indicating device produces an audible warning when the tolerance dosage of radiation has been registered.

4323
VIBRATION MEASURING DEVICE. H. F. Clarke (to U. S. Atomic Energy Commission). U. S. Patent 2,596,529, May 13, 1952.

In this vibration measuring device the only coupling with the observed object is an electromagnetic field and improved accuracy is obtained in the measurement of small displacements. Microwaves are injected into a waveguide and emitted from an open end thereof to impinge upon the observed vibrating surface. Part of the impinging energy is reflected back into the waveguide so that the amplitude of the reflected energy is a function of the instantaneous position of the observed surface.

4324
VIBRATION MEASURING DEVICE. H. F. Clarke (to U. S. Atomic Energy Commission). U. S. Patent 2,596,530, May 13, 1952.

This vibration measuring and indicating device has no physical connection with the vibrating body. The device is highly sensitive to small displacement, capable of high speed response without distortion, and responsive to vibratory phenomena over a wide range of frequencies. The system comprises a source for inducing wave energy in a waveguide, means for supporting the vibrating body directly in the path of incident energy emitted from the waveguide so

that wave energy is reflected back into the guide, and detector means supported in the waveguide for creating a varying unidirectional potential corresponding to the instantaneous standing-wave pattern, which in turn corresponds to the position of the vibrating body.

4325

VIBRATION MEASURING DEVICE. H. F. Clarke (to U. S. Atomic Energy Commission). U. S. Patent 2,596,531, May 13, 1952.

In this vibration measuring device, capable of accurately measuring small displacements, the only coupling with the observed object is by an electromagnetic field. This device employs a microwave guide section known as the magic tee or T-bridge, having four arms, and associated apparatus. When microwave energy is injected into a first one of the arms, the vibrating body is supported in opposition to the energy path of the third arm and a load equal to the vibrating body in its mean position terminates the energy path of the fourth arm. Energy is emitted from the second arm corresponding to displacement of the vibrating body from its mean position.

4326

ELECTRONIC RELAY CIRCUIT. L. G. Nierman (to U. S. Atomic Energy Commission). U. S. Patent 2,596,956, May 13, 1952.

This patent describes an improved direct voltage actuated electronic relay circuit which is highly sensitive yet simple, stable and reliable.

4327

RADIOACTIVE ASSAY APPARATUS. E. G. Segre (to U. S. Atomic Energy Commission). U. S. Patent 2,597,535, May 20, 1952.

This suitably shielded apparatus, adapted to assay fissionable material, is so designed that a single source of neutrons may be utilized to simultaneously irradiate one or more of a plurality of samples of fissionable material placed in separate ionization chambers positioned around the neutron source.

4328

INSULATOR BUSHING SEAL. J. D. Reid (to U. S. Atomic Energy Commission). U. S. Patent 2,597,596, May 20, 1952.

This mechanical seal for a stem or the like passing through the side wall of an evacuated chamber is provided with a pumpout space within the seal itself so that the effectiveness of the seal is assured without having to depend on other apparatus or attachments.

4329

IONIZATION CHAMBER. C. J. Borkowski and R. H. Firminhac (to U. S. Atomic Energy Commission). U. S. Patent 2,598,215, May 27, 1952.

This ionization chamber is particularly adapted to measuring α radiation from radioactive dust particles collected on a large sheet of filter paper or the like. One end of the chamber is threadably removable and is integral with the tubular electrode which supports the sample to be counted.

4330

THERMAL NEUTRON DETECTOR ELEMENT. H. W. Bousman (to U. S. Atomic Energy Commission). U. S. Patent 2,599,156, June 3, 1952.

The cylindrical element used as the electrode in a thermal-neutron detecting and counting device is provided with a base coat of unenriched boron and a surface coat in intimate contact therewith of boron enriched in B^{10}.

4331

PULSE TYPE TRANSFORMER. Q. A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent 2,599,182, June 3, 1952.

A method is described for winding a low-leakage-reactance pulse transformer having a compositely wound primary and secondary coil. This low-capacitance transformer will pass voltage pulses with little or no distortion and is capable of providing any desired ratio of transformation.

4332

MAGNETIC PEELER FOR PROTON SYNCHROTRON. M. S. Livingston (to U. S. Atomic Energy Commission). U. S. Patent 2,599,188, June 3, 1952.

An arrangement is described for deflecting accelerated high-energy charged particles from curved orbits in a particle accelerator. The apparatus comprises means for changing the magnetic flux of a short segment adjacent the closed path about which the particles are being accelerated and means for moving the flux changing means toward and away from the ion path.

4333

MONITORING OF GAS FOR RADIOACTIVITY. W. R. Kanne (to U. S. Atomic Energy Commission). U. S. Patent 2,599,922, June 10, 1952.

This ionization chamber, designed to provide a large field strength-to-voltage ratio and having open-mesh screen electrodes so as to permit the largest possible paths in the chamber for β rays, is particularly useful in monitoring the radioactivity of a gas stream.

4334

HIGH-VOLTAGE MULTIPLE CORE TRANSFORMER. Q. A. Kerns (to U. S. Atomic Energy Commission). U. S. Patent 2,600,057, June 10, 1952.

This multiple-core transformer has low stray capacitance and low leakage reactance and withstands very high voltage pulses of short duration.

4335

ION PRODUCING MECHANISM. J. G. Backus (to U. S. Atomic Energy Commission). U. S. Patent 2,600,151, June 10, 1952.

This simple ion generator of the type employing electron bombardment of the solid body to be ionized is particularly useful for forming metal ions.

4336

DIRECT CURRENT TO ALTERNATING CURRENT SIGNAL CONVERTER. E. E. St. John (to U. S. Atomic Energy Commission). U. S. Patent 2,600,172, June 10, 1952.

This modulator circuit and apparatus produces an a-c output signal proportional in magnitude and corresponding in phase to the magnitude and sign, respectively, of the difference between two d-c input signals, and also produces an a-c output signal proportional to a d-c input signal.

4337

VACUUM SYSTEM LEAK DETECTOR. S. M. MacNeille (to U. S. Atomic Energy Commission). U. S. Patent 2,600,891, June 17, 1952.

This patent covers an easily operated leak detector of the type which employs a gas probe in which the passage of the foreign gas through the leak causes a voltage change in a gage and associated oscillator means whereby an audible sound is produced.

4338

METHOD AND APPARATUS FOR MEASURING LOW PRESSURES AND RELATED CONDITIONS. W. G. Stone (to U. S. Atomic Energy Commission). U. S. Patent 2,600,936, June 17, 1952.

This apparatus and method for measuring pressure comprises heating a Pirani resistance with a substantially constant alternating current in the region where the pressure is to be measured, varying the pressure in said region, successively measuring the amplitude variation of different harmonics of the voltage drop across the resistance to determine the one harmonic having an amplitude modulated in accord with variation in the pressure, and thereafter isolating and measuring the amplitude of this one harmonic as an index of the pressure.

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 6B, page "SUPPLEMENT 1".

$_{2}He_{3}^{5}$	$n\alpha(\theta)$ $P_{3/2} - P_{1/2}$ split by ~5 Mev	$He^4(n,n)$	R. K. Adair, Phys. Rev. 86, 155(1952).
$_{2}He_{4}^{6}$	Level 1.71	$Li^7(t,\alpha)$	J. T. Dewan et al., Phys. Rev. 86, 416 (1952).
$_{3}Li_{2}^{5}$	p's from $Li^6(d,t)Li^5(p)He^4$ consistent with Q = 1.8		R. W. Gelinas, S. S. Hanna, Phys. Rev. 86, 253(1952).
$_{3}Li_{4}^{7}$	Level 4.61	$Li^6(d,p)$	R. W. Gelinas, S. S. Hanna, Phys. Rev. 86, 253(1952).
$_{6}C_{5}^{11}$	Levels 1.85 7.39 4.23 8.08 4.77 8.39 6.40 8.62 6.77	$B^{10}(d,n)C^{11}$ ppl	V. R. Johnson, Phys. Rev. 86, 302(1952).
$_{6}C_{6}^{12}$	Levels 9.6 12.76 10.8 15.09 11.1 16.07 11.74	$B^{11}(d,n)C^{12}$ ppl	V. R. Johnson, Phys. Rev. 86, 302(1952).
$_{10}Ne_{9}^{19}$	τ 18.5 s β^+ 2.18 No γ with E_γ >0.51	F(p,n) sπ scin	G. Schrank, J. R. Richardson, Phys. Rev. 86, 248(1952); 83, 891A(1951).
$_{11}Na_{10}^{21}$	τ 22.8 s β^+ 2.50 No γ with E_γ>0.51	Mg(p,α) sπ scin	G. Schrank, J. R. Richardson, Phys. Rev. 86, 248(1952); 83, 891A(1951).
$_{13}Al_{14}^{27}$	q 0.155 with configuration interaction (unshielded)	Calc M	G. F. Koster, Phys. Rev. 86, 148(1952).
$_{13}Al_{15}^{28}$	β^- 2.87 γ 1.78 β to ground < 2%	sl sl;pe$^-$	H. T. Motz, D. E. Alburger, Phys. Rev. 86, 165(1952); 83, 215A(1951).
Si	Relative abundances 28 92.14% 29 4.73% 30 3.13%	ms	J. F. Norton, P. D. Zemany, J. Chem. Phys. 20, 525(1952).
$_{15}P_{17}^{32}$	$\bar{E}_{\beta^-}$ 0.70 ± 0.03	ic	R. S. Caswell, Phys. Rev. 86, 82(1952).
$_{17}Cl_{18}^{35}$	q −0.0782 with configuration interaction (unshielded)	Calc M	G. F. Koster, Phys. Rev. 86, 148(1952).
$_{17}Cl_{20}^{37}$	q −0.0616 with configuration interaction (unshielded)	Calc M	G. F. Koster, Phys. Rev. 86, 148(1952).
$_{19}K_{21}^{40}$	γX,γ(Auger e$^-$) consistent with K/γ = 1		M. Paganelli, G. Quareni, Phys. Rev. 86, 423(1952); Nuovo cimento 9, 324(1952).
	μ −1.2964 $g_I(K^{40})/g_I(K^{39})$ = −1.24346 ± 0.00024	M	J. T. Eisinger et al., Phys. Rev. 86, 73 (1952); 85, 716A (1952).
$_{20}Ca_{25}^{45}$	$\bar{E}_{\beta^-}$ 0.0746 ± 0.003	ic	R. S. Caswell, Phys. Rev. 86, 82(1952).
$_{23}V_{25}^{48}$	γ ~4% 2.22 Crossover γ <0.5%	scin	H. K. Ticho et al., Phys. Rev. 86, 422 (1952). Ti(p,n); chem.
Fe	σ_{el}(1.9 Mev) 1.4 σ_{in}(1.9 Mev) 0.8 assuming isotropy		P. H. Stelson, W. M. Preston, Phys. Rev. 86, 132(1952).
$_{28}Fe_{30}^{56}$	Level 0.850	Fe(n,n) ppl	P. H. Stelson, W. M. Preston, Phys. Rev. 86, 132(1952).
$_{31}Ga_{38}^{69}$	q 0.189 with configuration interaction (unshielded)	Calc M	G. F. Koster, Phys. Rev. 86, 148(1952).
$_{31}Ga_{40}^{71}$	q 0.119 with configuration interaction (unshielded)	Calc M	G. F. Koster, Phys. Rev. 86, 148(1952).
$_{32}Ge_{45}^{77}$	β^- 23% 0.710 35% 1.379 42% 2.196 γ 0.042 0.073 0.327 0.466 0.213 0.368 0.564 0.264 0.408 1.105 0.300 0.418 ~1.75 (2.196β)(γ) (0.073γ)(0.264γ) (0.213γ)(0.264γ)	sl sl;pe$^-$,ce$^-$	A. B. Smith, Phys. Rev. 86, 98(1952). Ge(d); chem.

$_{34}Se^{77}_{43}$	μ	+0.53326 ±0.00005	I	S. S. Dharmatti, H. E. Weaver, Jr., Phys. Rev. 86, 259(1952).
$_{35}Br^{75}_{40}$	β^+	19% 0.3 15% 0.6 20% 0.8 46% 1.70	sπ	S. C. Fultz, M. L. Pool, Phys. Rev. 86, 347(1952); 86, 631A (1952). $Se^{74}(p,\gamma)$.
$_{35}Br^{76}_{41}$	τ	17.2^h		S. C. Fultz, M. L. Pool, Phys. Rev. 86, 347(1952); 86, 631A(1952). Se^{76}(7.3 Mev p,n); chem.
	β^+	19% 0.6 14% 0.8 11% 1.1 10% 1.7 46% 3.57	sπ	
	γ	0.25 0.68 0.33 0.75 0.37 0.96 0.42 1.21	pe$^-$; ce$^-$	
	No (3.57 β^+)γ			
$_{35}Br^{77}_{42}$	τ	58^h		S. C. Fultz, M. L. Pool, Phys. Rev. 86, 347(1952); 86, 631A (1952).
	γ	0.160 0.299 0.234 0.521	sπ; ce$^-$	
	Xγ, No $\beta^+\gamma$			
$_{35}Br^{80}_{45}$ 18.5^m	β^-	9% 0.7 11% 1.1 80% 1.97	sπ	S. C. Fultz, M. L. Pool, Phys. Rev. 86, 347(1952); 86, 631A (1952). Se(p), Se(d).
	No (1.97 β^-)γ			
$_{35}Br^{83}_{48}$	β^-	0.94	sπ	S. C. Fultz, M. L. Pool, Phys. Rev. 86, 347(1952); 86, 631A (1952). Se(d).
$_{37}Rb^{87}_{50}$	τ	$6.38 \pm 0.3 \times 10^{10}$ y for 27.85%* abundance		M. H. MacGregor, M. L. Wiedenbeck, Phys. Rev. 86, 420 (1952). *A. O. Nier, Phys. Rev. 79, 450(1950).
	No βe^-			
$_{39}Y^{90}_{51}$	$\bar{E}_{\beta^-}$	0.90 ± 0.04	ic	R. S. Caswell, Phys. Rev. 86, 82(1952).
$_{40}Zr^{91}_{51}$	μ	−1.1	S	S. Suwa, Phys. Rev. 86, 247(1952).
$_{41}Nb^{92}_{51}$	γ	0.933	scin	H. K. Ticho et al., Phys. Rev. 86, 422 (1952). Nb^{93}(20 Mev p); chem.
$_{41}Nb^{93}_{52}$	γ	1.84	scin	H. K. Ticho et al., Phys. Rev. 86, 422 (1952). Nb^{93}(p); chem.
	τ	$\gg 10^d$		
$_{44}Ru^{103}_{59}$	γ	0.52	scin	V. O. Eriksen et al., Physica 18, 91(1952).
$_{45}Rh^{106}_{61}$	$(0.624\gamma)(0.513\gamma)(\theta)$ consistent with I = 0,2,0			G. B. Arfken et al., Phys. Rev. 86, 413 (1952).
	$(1.045\gamma)(0.513\gamma)(\theta)$ suggests I(1.55 level) = 2			
$_{49}In^{113}_{64}$ 1.7^h	γ	(0.390) α = 0.55	scin	T. B. Cook, Jr., S. K. Haynes, Phys. Rev. 86, 190(1952).
$_{49}In^{113}_{64}$	q	0.820 Calc M with configuration interaction (unshielded)		G. F. Koster, Phys. Rev. 86, 148(1952).
$_{49}In^{115}_{66}$	q	0.834 Calc M with configuration interaction (unshielded)		G. F. Koster, Phys. Rev. 86, 148(1952).
$_{51}Sb^{124}_{73}$	γ ~50%* (0.603) α_K = 0.0042 E2			F. R. Metzger, Phys. Rev. 86, 435(1952). *% of disintegrations.
	0.60γ no parity change ($\beta\gamma$) polarization			R. Stump, Phys. Rev. 86, 249(1952).
$_{53}I^{121}_{78}$	$\bar{E}_{\beta^-}$	0.189 ± 0.008	ic	R. S. Caswell, Phys. Rev. 86, 82(1952).
$_{62}Sm^{147}_{85}$	I	½	para	G. S. Bogle, H. E. D. Scovil, Proc. Phys. Soc., (London) A65, 368(1952).
	$\lvert\mu\rvert$	0.7	para	R. J. Elliott, K. W. H. Stevens, Proc. Phys. Soc., (London) A65, 370(1952).
	$\lvert q\rvert$	<0.7		
$_{62}Sm^{149}_{87}$	I	½	para	G. S. Bogle, H. E. D. Scovil, Proc. Phys. Soc., (London) A65, 368(1952).
	$\lvert\mu\rvert$	0.6	para	R. J. Elliott, K. W. H. Stevens, Proc. Phys. Soc., (London) A65, 370 (1952).
	$\lvert q\rvert$	<0.7		
$_{63}Eu^{152}_{89}$	$(0.123\gamma)(0.344\gamma)$ $(0.121\gamma)(0.244\gamma)$ No $(0.244\gamma)(0.344\gamma)$		e$^-$e$^-$	C. M. Fowler, R. G. Shreffler, Rev. Sci. Instruments 21, 740 (1950).
Gd	Isotope shift			S. Suwa, Phys. Rev. 86, 247(1952).
$_{64}Gd^{155}_{91}$	I	≥ ½	S	S. Suwa, Phys. Rev. 86, 247(1952).
	$\lvert\mu\rvert$	~0.3	S	
$_{64}Gd^{157}_{93}$	I	≥ ½	S	S. Suwa, Phys. Rev. 86, 247(1952).
	$\lvert\mu\rvert$	~0.3	S	
$_{72}Hf^{181}_{109}$ 46^d	$(0.130\gamma)(0.471\gamma)$ $(0.130\gamma)(0.337\gamma)$ $(0.134\gamma)(0.337\gamma)$		e$^-$e$^-$	C. M. Fowler, R. G. Shreffler, Rev. Sci. Instruments 21, 740 (1950).
	No βe^-			
$_{78}Pt^{195?}_{117}$	τ	~4^d		J. M. Cork et al., Phys. Rev. 86, 415 (1952). Pt(n,γ); chem.
	γ	0.0991 0.1298 K/L = 0.1	sπ;ce$^-$ (Pt)	
$_{78}Pt^{197}_{119}$	γ	0.0774 0.1912 K/L = 6.0	sπ;ce$^-$ (Au)	J. M. Cork et al., Phys. Rev. 86, 415 (1952). Pt(n,γ); chem.
$_{79}Au^{199}_{120}$	γ	0.0498 0.1585 K/L = 0.56, L/M = 3.6 0.2083 K/L = 4.5	sπ;ce$^-$ (Hg) (Hg)	J. M. Cork et al., Phys. Rev. 86, 415 (1952). Pt(n,γ); chem.

$_{83}Bi^{210}_{127}$	τ	5.02 ± 0.02^d	F. Begemann, F. G. Houtermans, Z. Naturforsch. 7a, 143(1952).
$_{83}Bi^{211}_{128}$	α	82.6% (6.621) ppl 17.4% 6.274	G. Vieira, L. Salgueiro, Compt. rend. 234, 1765(1952).
$_{83}Bi^{214}_{131}$	γ I γ I 0.606 9.0 1.520 0.7 sπ; 0.766 1.3 1.761 3.2 Cpt 0.933 1.1 1.820 0.2* 1.120 2.6 2.200 1.0 1.238 1.0 2.420 0.5 1.379 0.9 2.090?		S. Kageyama, J. Phys. Soc. Japan 7, 93 (1952). *Value of 47L24 in Nuclear Data should read 0.32 not 3.2.
$_{84}Po^{210}_{126}$	Pb L x ray/$\alpha = 2.9 \times 10^{-4}$ pc		W. Rubinson, W. Bernstein, Phys. Rev. 86, 545(1952).
$_{84}Po^{210}_{126}$	e^- ejection by α's Pb K x ray*/0.800γ = 0.13 Pb K x ray*/$\alpha = 2.0 \times 10^{-6}$ scin No (0.800γ) X (0.025 − 2.5γ)/(0.800γ)<0.1		W. C. Barber, R. H. Helm, Phys. Rev. 86, 275(1952). *Assuming all radiation of ~76 kev to be Pb K x ray.
$_{88}Ra^{224}_{136}$	γ ~0.050 sπ;ce$^-$ 0.241 $\alpha_K = 0.1$ E2		S. Rosenblum et al., Compt. rend. 234, 1767(1952).

Q's Between Ground States

$Li^7(t,\alpha)He^6$	+9.79 ± 0.03	J. T. Dewan et al., Phys. Rev. 86, 416(1952).
$Na^{23}(p,n)Mg^{23}$	−4.88 ± 0.01	H. B. Willard et al., Phys. Rev. 86, 259(1952).

Packing Fraction Differences, Δf, in Units 10^{-4} amu

Doublet	Δf	Reference
$Si^{28}-CO$	−7.6 ± 0.2	J. F. Norton, P. D. Zemany, J. Chem. Phys. 20, 525(1952).
$Si^{28}-N_2$	−10.5 ± 0.1	
$Si^{28}-C_2H_4$	−21.3 ± 0.1	
$Ti^{46}-CH_2S$	−7.696 ± 0.009	T. L. Collins et al., Phys. Rev. 86, 408(1952).
$Ti^{47}-CH_3S$	−9.32 ± 0.02	
$Ti^{48}-C_4$	−10.88 ± 0.01	
$Ti^{49}-C_4H$	−12.23 ± 0.01	
$Ti^{50}-C_4H_2$	−14.178 ± 0.006	
$V^{51}-C_4H_3$	−15.54 ± 0.01	
$Cr^{50}-C_4H_2$	−13.91 ± 0.01	
$Cr^{52}-C_4H_4$	−17.48 ± 0.02	
$Cr^{53}-C_4H_5$	−18.56 ± 0.02	
$Cr^{54}-C_4H_6$	−19.85 ± 0.04	
$Mn^{55}-C_4H_7$	−21.20 ± 0.02	
$Fe^{54}-C_4H_6$	−19.85 ± 0.01	
$Fe^{56}-C_4H_8$	−22.82 ± 0.02	
$Fe^{57}-C_4H_9$	−23.70 ± 0.02	
$Fe^{58}-C_4H_{10}$	−24.96 ± 0.07	
$Ni^{58}-C_4H_{10}$	−24.72 ± 0.02	
$Ni^{60}-C_5$	−11.70 ± 0.05	
$Ni^{61}-C_5H$	−12.83 ± 0.04	
$Ni^{62}-C_5H_2$	−14.30 ± 0.01	
$Ni^{64}-SO_2$	−5.42 ± 0.01	
$Cu^{63}-C_5H_3$	−14.982 ± 0.008	
$Cu^{65}-C_5H_5$	−17.168 ± 0.008	
$Zn^{64}-SO_2$	−5.106 ± 0.003	T. L. Collins et al., Phys. Rev. 86, 408(1952).
$Zn^{64}-O_2$	−7.889 ± 0.007	
$Zn^{66}-C_5H_6$	−18.314 ± 0.008	
$Zn^{67}-C_5H_7$	−19.116 ± 0.008	
$Zn^{68}-C_5H_8$	−20.222 ± 0.009	
$Zn^{70}-C_5H_{10}$	−21.840 ± 0.007	